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Integrated Resource Inventory

INTEGRATED RESOURCE INVENTORY
OF DEEP BASIN STUDY AREA (NTS 83L)
VOLUME I

Alberta


ENERGY AND
NATURAL RESOURCES
Resource Evaluation
and Planning



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INTEGRATED RESOURCE INVENTORY
OF DEEP BASIN STUDY AREA (NTS 83L)
VOLUME I



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AN INTEGRATED RESOURCE INVENTORY
OF
DEEP BASIN AREA (NTS 83L)

PHYSICAL LAND CLASSIFICATION
FORAGE INVENTORY AND
ECOLOGICAL LAND CLASSIFICATION

VOLUME I

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ABSTRACT

The Deep Basin (NTS 83L) study area is located in west-central Alberta adjacent to the Alberta-British Columbia boundary. In 1982, an Integrated Resource Inventory was initiated for this area utilizing information derived from aerial photographs, fieldwork and literature reviews. This study provides an inventory of the landforms, surficial deposits, soils, vegetation and climate of the area and identifies their characteristics and interrelationships.

The study area includes portions of the Wapiti Plains, Western Alberta Plains, Rocky Mountain Foothills and Rocky Mountains physiographic regions. During the pleistocene epoch the area was glaciated by both Cordilleran and Continental ice sheets in addition to localized alpine glaciation. Morainal, glaciofluvial and glaciolacustrine deposits are present as a result of glaciation. Post glacial reworking of these deposits has altered the landscape to some extent. As a result, recent colluvial, fluvial, eolian and organic deposits are also part of this landscape.

The vegetation in the study area falls within six ecoregions. These ecoregions are based on climate as expressed by the vegetation and range from the Alpine, which consists of heather and shrubland vegetation, to the Boreal Mixedwood which is characterized by aspen forests. Also, included in this range are the Subalpine (lodgepole pine, Engelmann spruce and subalpine fir dominated), Boreal Uplands (lodgepole pine dominated), Boreal Foothills (aspen, spruce and pine) and Montane (lodgepole pine and grassland).

The relationships among soil, vegetation, parent materials and topography are described in the report. The vegetation is classified to an association level and the soils to the subgroup level.

KEY WORDS: Deep Basin, NTS-83L, bedrock geology, surficial geology, ecoregions, vegetation, soils, climate, plant associations, wildlife, Ecological Land Classification, Physical Land Classification, Forage Inventory.

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PREFACE

The Deep Basin study was initiated in 1982 at the request of Scientific and Engineering Services and Research Division of Alberta Energy and Natural Resources. The purpose of this study was to provide baseline inventory data for assessment of the impact of large scale intensive development of oil and gas resources.

This report provides a discussion of methods employed in the inventory processes, detailed information on the physical and biological characteristics of the landscape and a general description of the natural resources of the area.

The text is accompanied by four ecological land classification maps at a scale of 1:100 000 and sixteen physical land classification maps at a scale of 1:50 000.

It is important to realize that the basic purpose of this study is to provide information for natural resource planning and management. For detailed operational planning and management further on-site examination may be necessary.

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LIST OF ABBREVIATIONS

Surficial Materials

C	Colluvium
E	Eolian
F	Fluvial
F*	Pre-glacial (Tertiary) gravels
GF	Glaciofluvial
GL	Glaciolacustrine
M	Morane
O	Organic
R	Rock
X	Residual

Textures

S	Sand
LS	Loamy sand
SL	Sandy loam
L	Loam
SiL	Silt loam
Si	Silt
SCL	Sandy clay loam
CL	Clay loam
SiCL	Silty clay loam
SC	Sandy clay
SiC	Silty clay
C	Clay

Surficial Material Modifiers

v	Veneers
b	Blankets

Textural Modifiers

g	Gravelly
k	Cobbly
r	Rubble

Soils

O.GL	Orthic Gray Luvisol
BR.GL	Brunisolic Gray Luvisol
PZ.GL	Podzolic Gray Luvisol
SZ.GL	Solonetzic Gray Luvisol
GL.GL	Gleyed Gray Luvisol
GLBR.GL	Gleyed Brunisolic Gray Luvisol
GLSZ.GL	Gleyed Solonetzic Gray Luvisol
O.DYB	Orthic Dystric Brunisol
E.DYB	Gleyed Eluviated Dystric Brunisol
GLE.DYB	Gleyed Eluviated Dystric Brunisol
O.EB	Eluviated Eutric Brunisol
E.EB	Eluviated Eutric Brunisol
GLE.EB	Gleyed Eluviated Eutric Brunisol
O.R	Orthic Regosol
CU.R	Cumulic Regosol
GL.R	Gleyed Regosol
GLCU.R	Gleyed Cumulic Regosol
O.G	Orthic Gleysol
R.G	Rego Gleysol
O.LG	Orthic Luvisol Gleysol
TY.M	Typic Mesisol
T.M	Terric Mesisol

Drainage Classes

1	Rapidly drained
2	Well drained
3	Moderately well drained
4	Imperfectly drained
5	Poorly drained
6	Very poorly drained

PART I

1. INTRODUCTION

This report integrates the results of three natural resource inventories of the Deep Basin area (NTS 83-L); Physical Land Classification (PLC), Ecological Land Classification (ELC) and Forage Inventory. For the purposes of this study these inventories have used a common mapping base, so that component data will be compatible for managers and planners responsible for wise use and optimal allocation of a variety of resources. The classification systems employed in these inventories are hierarchical, to allow interpretations for resource use to be made at a variety of scales. The data presented in this report describe the inherent properties of the landscape, and are not interpreted for particular uses within this report.

Each of the component inventories had distinct objectives. Physical Land Classification is designed to meet the physical land resource data needs of Alberta Energy and Natural Resources and other governmental and research agencies. The system employs an open legend to classify the landscape according to its mode of origin, composition and form.

The objective of Ecological Land Classification is to provide information on the relationships between the physical and biological components of the landscape. This system classifies the landscape according to its physical characteristics as in the PLC system and incorporates the vegetative pattern to describe units according to plant species composition. The ELC uses a closed legend format to identify

areas with recurring patterns of landform and vegetation which can subsequently be evaluated for various resource uses.

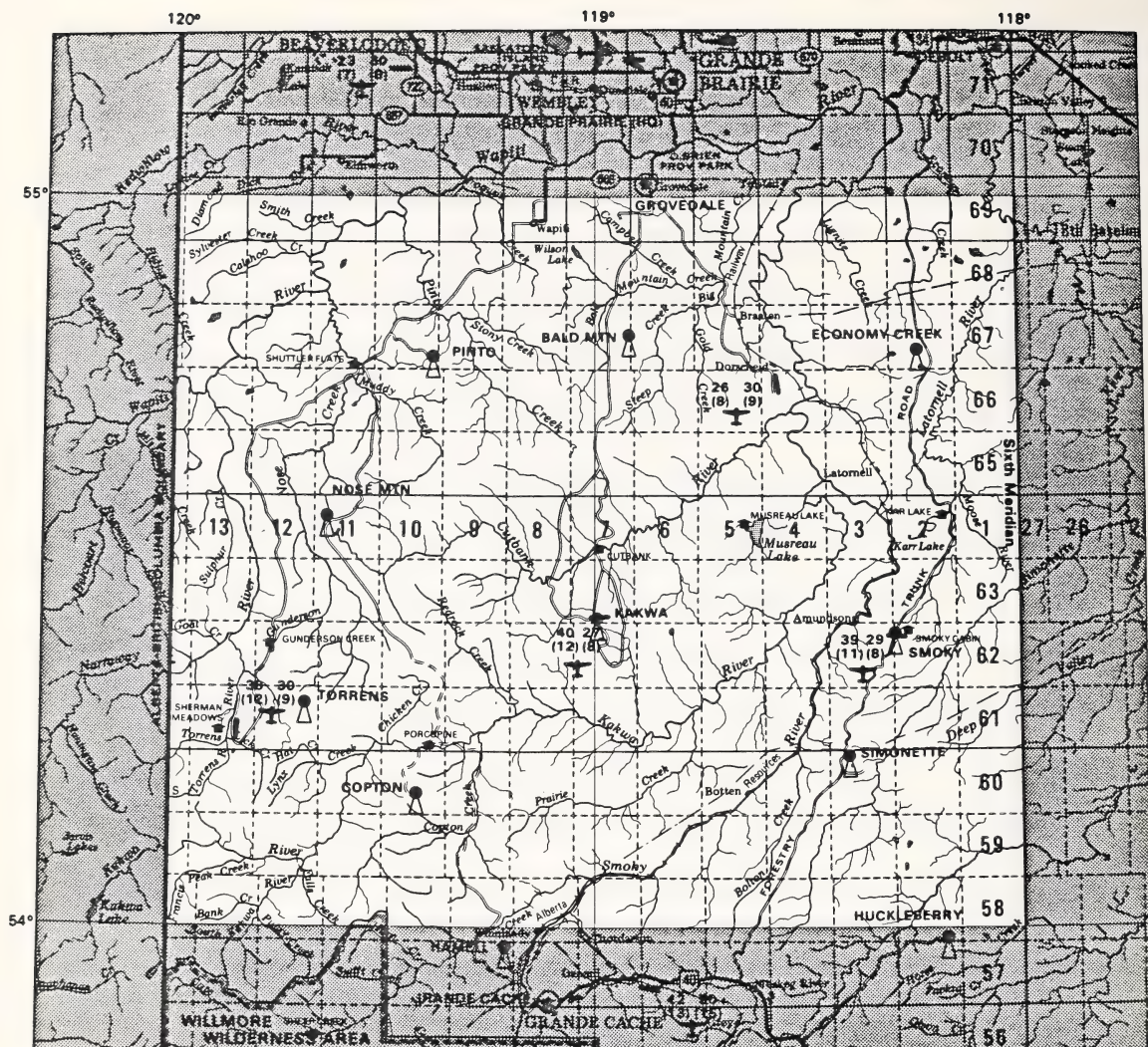
The Forage Inventory is an integral part of Ecological Land Classification in this report. Its purpose is to identify the plant associations characteristic of different sets of environmental conditions. The pattern of plant associations is related to the environmental pattern for each unit mapped in the Ecological Land Classification, but plant associations are not mapped individually.

2. LOCATION AND ACCESS

The Deep Basin study area is located in west-central Alberta adjacent to the British Columbia border (Figure 1). It includes the whole of NTS 83-L and extends from 54° to 55° north latitude and from 118° to 120° west longitude, encompassing an area of approximately 14,500 km² (5 600 mi.²).

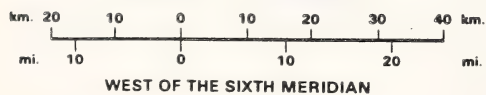
Access to the study area is provided mainly by the Forestry Trunk Road (Hwy. 940) which traverses the entire eastern portion of the study area. Two forestry roads by Proctor and Gamble (P & G) provide access from the north to the central and western portions of the area. The CANFOR road provides access from the north to the eastern portion of the study area and joins with the Forestry Trunk Road in Township 64, Range 2, W6M. Access from the south is provided mainly by mining roads that run north from the Smoky River Coal Co. sites. In response to the increased demands created by improved access, Alberta Forest Service has constructed recreational areas at Two Lakes, Musreau Lake, Bison Flats, Shuttler Flats, Nose Lake and Economy Lake.

There are no major population centres in the study area: the town of Grande Prairie is located about 19 km north of the study area, and Grande Cache lies approximately 10 km to the south.



DEEP BASIN STUDY AREA (N.T.S. BLOCK 83 L)

SCALE 1 : 1 000 000



Alberta Forest Service
Lookout Towers



Airstrip Elevation (A.S.L.) and Length
in Hundreds (100) of Ft
Airstrip maintained as required
use at PILOT DISCRETION

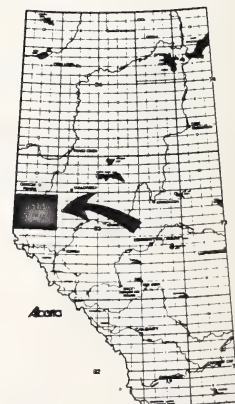


Figure 1: Study Area Location

3. METHODS

The integrated resource inventory of the Deep Basin area incorporates three component inventories; Physical Land Classification (PLC), Ecological Land Classification (ELC), and Forage Inventory. To accomplish this, a common mapping base was adopted by PLC and ELC, and the Forage Inventory classification was incorporated as an integral part of the ELC. The three classifications are thus compatible, however, the report is also intended to allow users who only require one component inventory to readily extract the information they need. In addition, major river and stream valleys have been classified separately in the ELC maps.

3.1 Classification Systems

The Physical Land Classification uses a four-tiered hierarchy to separate the landscape into discrete units. The hierarchy is as follows:

Physiographic Region:

Topographically alike landscapes with similar relief, structural geology and elevation; mapped at 1:1 000 000 to 1:3 000 000.

Physiographic Subregion:

Distinct patterns of relief, geology and geomorphology, drainage pattern and density; mapped at 1:250 000 to 1:1 000 000.

Geomorphic System:

Recurring patterns of landform as differentiated by origin, composition and surface expression; soils are classified and incorporated

to either the great group or subgroup level; mapped at 1:50 000 to 1:250 000.

Geomorphic Unit

Homogeneous land unit differentiated on mode of origin, composition, surface expression, texture, slope, aspect, drainage; soils incorporated to subgroup family, series or type; mapped at 1:50 000 to 1:250 000.

PLC is presented in the form of 16 maps at a scale of 1:50 000. Geomorphic units are labeled with an open legend format, e.g.

Modifier

Surface Expression

$\frac{Mb}{R}$ MF

rSiL

Texture

Parent Material

H-SE

$\frac{OGL/E.EB}{3/2}$

Slope

Soil

Aspect

Soil Drainage

The other levels of the hierarchy are distinguished by different line weight and form. A full explanation of this open legend can be found on any one of the 16 PLC maps.

The Ecological Land Classification is also a four-tiered hierarchy as described below:

Ecoregion:

Area characterized by a distinctive regional climate as expressed by vegetation; mapped at 1:1 000 000 to 1:3 000 000.

Ecodistrict:

Distinct physiographic and/or geologic patterns; similar relief, geology, geomorphology and genesis of parent material; mapped at 1:250 000 to 1:1 000 000.

Ecosection:

Recurring patterns of slope, landform, soil and vegetation; mapped at 1:100 000 to 1:250 000.

Ecosite:

Unique recurring combination of vegetation, soil, landform and other environmental components; mapped at 1:10 000 to 1:20 000.

A total of 4 maps at 1:100 000 were produced for the ELC. The ecoregion designation appears as a broad, cross-hatched line while the ecodistricts and ecosections are of different line weights. The ecosite level of classification was not used in this study. The map symbols for the ecodistricts and ecosections are of a closed legend format. An example is as follows:

KF - M2

Ecodistrict	Material	
(Kakwa Foothills)	Modifier	Ecosection
	(Moraine)	Number

The Forage Inventory employs three levels of classification to describe vegetation; ecoregion, plant association and plant community. The plant community is a site specific description of vegetation and related environmental factors. Communities are grouped into plant associations which are an assemblage of plant communities with similar

vegetation and environmental relationships. These associations are subsequently grouped by characteristic species groups which reflect climatic influences, to define ecoregion concepts.

For the purpose of this study two levels of the ELC and PLC hierarchy use a common map base. The physiographic subregion boundaries are the same as the ecodistrict boundaries and the geomorphic system delineations are the same as those for ecosections. The ecoregions and physiographic regions are based on different concepts so are not mapped as the same unit. The rationale for this is that vegetation and climate (which define ecoregion), while interacting with major physiographic differences, do not correspond exactly to divisions at the physiographic region level.

The geomorphic unit is presented on PLC maps as a further subdivision of the geomorphic system to provide greater detail which is useful for more site specific planning and operational management decisions. The Forage Inventory is not mapped directly at the plant association level, but the classification is incorporated into the ecosection descriptions within the report.

The valleys of major streams and rivers have been classified separately from the rest of the landscape in this report. This system of classification reflects the fact that these valleys are more similar to each other than they are to the uplands they cross, because of the dominant influence of erosional and depositional process.

Valleys have been mapped in their entirety at a scale of 1:100 000, to preserve their physical integrity for regional planning

purposes. On the 1:50 000 scale maps individual landforms within valleys (valley sides, terraces, floodplains) are mapped separately using the PLC open legend, a format that may be more useful for local planning, management and operational concerns.

Streams and rivers are differentiated by stream order, valley form, floodplain characteristics, channel form and channel slope. Valley and floodplain surficial materials and vegetation are described for each fluvial system. These fluvial systems appear on ELC maps as the letter F followed by the system number, e.g. F12.

3.2 Mapping and Field Methods

Inventory procedures used for this study can be divided into four phases: preliminary interpretation, fieldwork, final classification and mapping, and field checking.

Aerial photographs are used in the preliminary phase to divide the landscape into discrete units to the geomorphic system/ecosection level of detail. These polygons are based on recurring patterns of landform, surface expression, and drainage. These preliminary maps and existing scientific information are subsequently used as a basis for design of a stratified sampling program.

Approximately 500 field sites were inventoried during the 1982 and 1983 field seasons. Elevation, aspect, slope, landform and parent materials, soil, internal drainage, ecological moisture regime, ecological nutrient regime and vegetation cover, and composition were described for each site. For the soil, horizon sequence, texture,

structure, consistency, pH, clast content and rooting depths were described (CSSC, 1978). In addition, observations were made on effects of disturbance and successional patterns.

Plant species cover and composition were analyzed using a 20 x 20 m plot for tree species, a 5 x 5 m plot for the shrub layer, and five 1 x 0.5 m quadrants on a 20 m transect for forb, grass, moss and lichen cover. Plant communities identified in this analysis were subsequently grouped into plant associations using the Klinka-Phelps vegetation program and Environmental Site Program (Appendix B, Volume II).

Final classification and mapping involved revision of preliminary polygons based on fieldwork, and the development of open (PLC) and closed (ELC) legends summarizing data collected in the field.

Following final revisions, a number of sites were selected to serve as a test of accuracy of the final maps. Approximately 60 sites were selected for field checking in the south half of NTS 83-L in 1982 and 1983. A similar number of sites were selected in the north half of the map sheet, but it was not possible to field check these sites for inclusion in this report. These sites will be field checked in 1984, and results for the entire map sheet will be published separately.

PART II - ECOLOGICAL AND PHYSICAL LAND CLASSIFICATION

1. ECOREGION

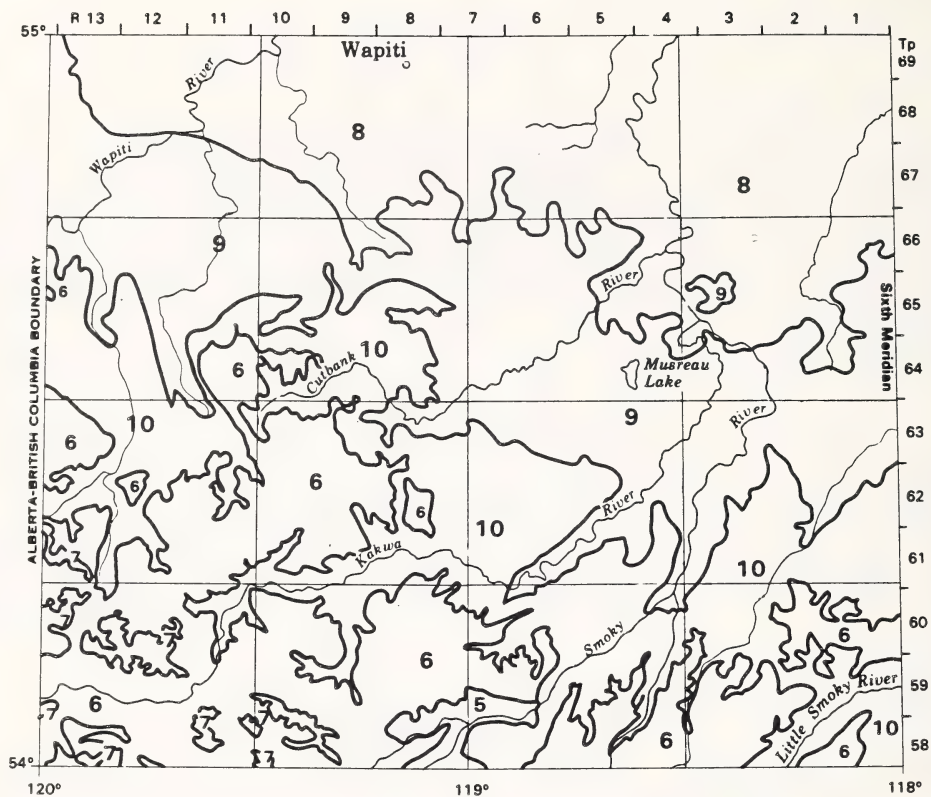
The ecoregions recognized in this study are based on the broad concepts presented in **Ecoregions of Alberta** (Strong and Leggat, 1981) with map revisions made possible by more intensive fieldwork and the inclusion of characteristic plant association on modal sites as a mapping criterion.

There are six ecoregions in the study area: Boreal Mixedwood, Boreal Foothills, Boreal Uplands, Subalpine, Alpine and Montane (Figure 2). The distinguishing features of each ecoregion are described below with detailed plant association descriptions and data appearing in Volume II.

1.1 Boreal Mixedwood

The Boreal Mixedwood Ecoregion (Ecoregion 8, Strong and Leggat) occurs in the northern portion of the study area (Figure 2) at lower elevations than the Boreal Foothills Ecoregion (below approximately 860 m asl).

The climate of this ecoregion is continental. More than 70% of yearly precipitation is received during the summer months, with July being the wettest month. Winter temperatures are colder than other ecoregions in the study area with chinooks not as important to the winter climate. Specific climatic parameters for stations within the study area are shown in Appendix E.



DEEP BASIN STUDY AREA (N.T.S. BLOCK 83 L)

SCALE 1 : 1 000 000



WEST OF THE SIXTH MERIDIAN

ECOREGIONS

- 5 Montane Variant**
- 6 Subalpine**
- 7 Alpine**
- 8 Boreal Mixedwood**
- 9 Boreal Foothills**
- 10 Boreal Uplands**

Figure 2: Ecoregions

The topography of the area is level to undulating. Glaciolacustrine materials dominate as this is a former glacial lake basin.

Aspen dominates the forest vegetation on moderately well drained modal sites with luvisolic soils in this ecoregion. Understory vegetation typically consists of a well developed deciduous shrub layer of rose and low-bush cranberry and a variety of herbaceous plants and grasses. The moss layer is usually sparse. Secondary succession is by white spruce, although a high frequency of fires has slowed its establishment over large portions of the ecoregion in the study area. Invasion by spruce will be slow due to lack of an adequate seed source in many years. As aspen stands succeed to white spruce the shrub and herb layers tend to decrease in cover while the moss layer increases.

Balsam poplar occurs on imperfectly drained sites with gleyed luvisolic and gleysolic soils. Aspen and white spruce are often a component of these stands. Understory vegetation is generally more lush than on modal sites with the presence of bracted honeysuckle and red osier dogwood reflecting higher moisture availability. Succession to white spruce would be expected to be faster on these moisture sites but vegetation competition from shrub and herb layers slows seedling establishment.

Lodgepole pine is restricted to dry sites with coarse textured eolian and glaciofluvial materials. Shrub and forb layers are generally poorly developed on these sites with lichens commonly occurring. Soils

are dominantly Eluviated Eutric Brunisols with some Brunisolic Gray Luvisols.

Poorly drained areas support black spruce and tamarack wetlands with some sedge meadows and open shrubland occurring depending on local drainage conditions. Gleysols and organic soils are common at these sites.

There are 13 associations described for the Boreal Mixedwood in this study (Table 1). A schematic profile diagram showing generalized relationships between these associations is shown in Figure 3.

The upper elevation of the Boreal Mixedwood Ecoregion in this study area is approximately 860 m. Below this elevation lodgepole pine ceases to be a component of aspen stands on modal sites. The dry mixedwood subregion of the ecoregion was identified by Strong and Leggat in the northern portion of the study area at lower elevations. There were no vegetation differences observed in this study to substantiate this split; however, further study is required to verify its occurrence.

Table 1
PLANT ASSOCIATIONS OF THE BOREAL MIXEDWOOD ECOREGION

PLANT ASSOCIATION	SITE DESCRIPTION	DOMINANT PARENT MATERIAL	DRAINAGE
Trembling Aspen/Low-bush Cranberry/Dewberry	Modal sites	Glaciolacustrine clay loam	Well to moderately well
Trembling Aspen/Prickly Rose/Peavine	Coarse textured soils	Glaciofluvial or eolian sand	Well to rapid
Trembling Aspen-Balsam Poplar/Bracted Honeysuckle/Dewberry	Depressional sites or seepage areas	Glaciolacustrine clay loam	Well to moderately well
Trembling Aspen/Beaked Hazelnut/Wild Sarsaparilla	Warm relatively dry sites	Glaciofluvial and fluvial silt sand	Well to moderately well
Trembling Aspen/Thimbleberry/Wild Sarsaparilla	Relatively rich seepage areas	Variable	Moderately well to well
Lodgepole Pine/Blueberry/Lichen	Coarse textured dry sites	Eolian and glaciofluvial sand	Rapidly
Lodgepole Pine/Feathermoss	Moderately coarse textured soils	Glaciofluvial and eolian sand	Well to rapid
Lodgepole Pine/Low-bush Cranberry/Wild Sarsaparilla	Relatively dry sites	Eolian over glaciofluvial sands	Well
Black Spruce-Lodgepole Pine/Labrador Tea/Feathermoss	Lower slope moist sites	Variable	Moderately well to imperfect
White Spruce/Bracted Honeysuckle/Dewberry	Relatively rich moist areas	Variable	Imperfect to well
Black Spruce/Labrador Tea/Feathermoss	Depressional areas	Organic and glaciolacustrine	Imperfect to very poor
Tamarack-Black Spruce/Sedge/Sphagnum	Very wet depressional sites	Organic	Poor to very poor
White Spruce/Prickly Rose/Hairy Wild Rye	Dry moderately coarse textured soils	Eolian and glaciofluvial	Well to rapid rapid

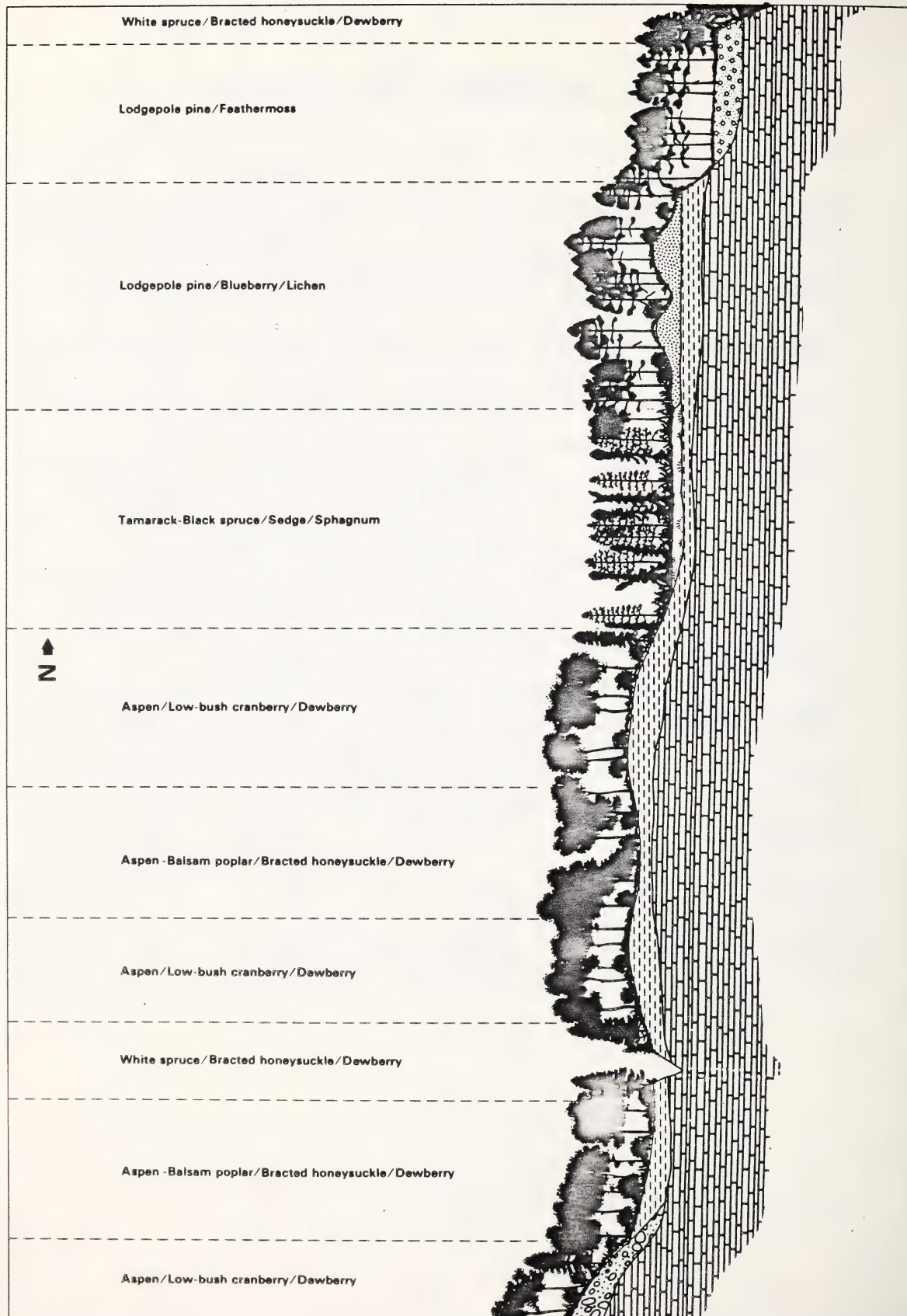


Figure 3: Schematic Profile of Landscape/Plant Association Relationships in the Boreal Mixedwood Ecoregion

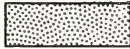
LEGEND

SURFACE MATERIALS

Organic



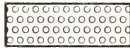
Eolian



Colluvium



Fluvial



Glaciofluvial



Glaciolacustrine



Moraine



Residual



BEDROCK

Sandstone



TREES AND SHRUBS

Aspen



Balsam poplar



White Spruce



Black Spruce



Lodgepole Pine



Subalpine Fir



Engelmann Spruce



Tamarack



Shrubs



1.2 Boreal Foothills

The Boreal Foothills Ecoregion (Ecoregion 9, Strong and Leggat, 1982) occupies a relatively narrow band trending northwest to southeast across the study area (Figure 2). It occurs above the Boreal Mixedwood Ecoregion from approximately 860 m to 1 060 m above sea level (asl).

The ecoregion represents an ecotone between Boreal and Cordilleran vegetation which is reflected in the change from deciduous dominated to coniferous dominated forests. The climate of the ecoregion results from both boreal and cordilleran influences. The boreal influence produces a summer high precipitation regime while the Cordilleran influence results in increased winter temperature and precipitation compared to the Boreal Mixedwood. Specific climatic parameters for climatic stations within the study area are shown in Appendix E.

The topography consists of undulating to rolling plateau remnants. Glacial till is the dominant surficial material.

Aspen, lodgepole pine and white spruce occur interchangeably or in mixtures on moderately well drained modal sites in the ecoregion. The deciduous component usually dominates at the lower elevations, while lodgepole pine is more prevalent in the upper portions. Understory vegetation in younger stands consists of well developed shrub and herb layers dominated by low-bush cranberry and wild sarsaparilla, respectively. Secondary succession is to white spruce with understory species diversity and density decreasing in the older stands.

Rapidly and well-drained sites are usually vegetated by lodgepole pine which can tolerate dry conditions. Understory species include lichens which reflect the dry site conditions. Soils are generally poorly developed Brunisols.

Imperfectly drained sites are dominated by lodgepole pine and black spruce with succession to black spruce. Understory vegetation is dominated by mosses and labrador tea. Common soils are Gleyed Luvisols and Gleysols.

There are eight associations identified for the ecoregion in the study area (Table 2). A schematic profile diagram showing generalized relationships between associations is shown in Figure 4.

The mapping criteria used for delineating the Boreal Foothills ecoregion in this study are based on the modal site concept. At the upper elevations, the Lodgepole pine/Low-bush cranberry/Wild sarsaparilla association predominates. These stands usually have a component of aspen in the overstory which becomes restricted to scattered clones near the upper elevation limits. Modal sites at lower elevations characteristically support the Aspen/Low-bush cranberry/Wild sarsaparilla association which has a pine component in the overstory. A very similar association occurs in the Boreal Mixedwood, however, pine is generally absent.

TABLE 2
PLANT ASSOCIATIONS OF THE BOREAL FOOTHILLS ECOREGION

PLANT ASSOCIATION	SITE DESCRIPTION	DOMINANT PARENT MATERIAL	DRAINAGE
Lodgepole Pine/Low-bush Cranberry/ Wild Sarsaparilla	Level to strongly sloping uplands	Moraine	Well to imperfect
Trembling Aspen/Low-bush Cranberry/ Wild Sarsaparilla	Nearly level to strongly sloping uplands	Moraine	Well to imperfect
White Spruce/Low-bush Cranberry/ Dewberry	Gently to moderately sloping north-facing uplands	Moraine	Well to imperfect
Lodgepole Pine/Labrador Tea/ Lichen	Dry sites with coarse textured soils	Glaciofluvial or eolian	Well to rapid
Lodgepole Pine/Labrador Tea/ Feathermoss	Depressional and valley bottom locations	Moraine and glaciofluvial over moraine	Well to imperfect
Black Spruce/Feathermoss	Valley bottoms	Lacustrine and organic	Poor to very poor
Tamarack-Black Spruce/Dwarf Birch/Sphagnum	Lower slope seepage areas	Fluvial or moraine	Moderately well to poor
White Spruce/Horsetail	Lower slope seepage areas	Fluvial or moraine	Moderately well to poor

Lodgepole pine/Low-bush cranberry/Wild sarsaparilla

Lodgepole pine-Black spruce/Labrador tea/Feathermoss

Lodgepole pine/Low-bush cranberry/Wild sarsaparilla

White spruce/Low-bush cranberry/Dewberry

White spruce/Horsetail

Aspen/Low-bush cranberry/Wild sarsaparilla

Black spruce/Feathermoss
Tamarack-Black spruce/Sedge/Sphagnum

N
▼

Figure 4: Schematic Profile of Landscape/Plant Association Relationships in the Boreal Foothills Ecoregion

1.3 Boreal Uplands

The Boreal Uplands Ecoregion (Ecoregion 9, Strong and Leggat, 1982) occupies a band trending northwest to southeast across the south central portion of the study area (Figure 2). It occurs above the Boreal Foothills at elevations ranging from approximately 1 060 m to 1 280 m asl.

The ecoregion resembles the Subalpine as coniferous forests are prevalent in both. However, the characteristic understory species are different. In addition, the potential climax species is considered to be white spruce or black spruce in the Boreal Uplands while Engelmann spruce or Engelmann spruce-white spruce hybrids are considered to be climax species in the Subalpine.

The climate of the Boreal Uplands shows a Cordilleran influence which produces warmer winter temperatures and cooler summer temperatures than other boreal ecoregions experience. The boreal influence, Continental precipitation regime, contributes maximum precipitation in the May to September period. Specific climatic parameters for climatic stations within the study area are shown in Appendix E.

The topography consists of undulating and rolling plateau remnants at higher elevations than the Boreal Foothills Ecoregion. Morainal and residual materials are dominant.

Lodgepole pine dominates the overstory on modal sites within the Boreal Uplands with white and black spruce as potential climax species.

In general, black spruce appears to be more prevalent in the pine stands occurring in slightly wetter locations. Understory vegetation on modal sites is not as diverse as in the Boreal Foothills. Ericaceous shrubs are common and the herb layer is generally sparse. Brunisolic Gray Luvisols predominate but Eluviated Eutric Brunisols are also common.

Imperfectly to poorly drained depressional areas are black spruce dominated with dwarf birch shrublands being common in the wettest of these sites. Organic and gleysolic soils are prevalent in these locations.

Aspen is restricted to steep south-facing slopes in the Boreal Uplands where temperatures are warmer due to increased solar radiation. Understory species in these stands reflect dry site conditions.

There are 11 associations identified in this study for the Boreal Uplands ecoregion (Table 3). A schematic diagram showing generalized relationship between associations is shown in Figure 5.

The upper elevation limit of the Boreal Uplands lies at about 1 280 m where the Lodgepole pine/White-flowered rhododendron/Feathermoss association generally replaces the Lodgepole pine/Labrador tea-Tall bilberry association on modal sites. The lower elevation boundary occurs at approximately 1 060 m where the Lodgepole pine/Low-bush cranberry/Wild sarsaparilla association of the Boreal Foothills replaces the Lodgepole pine/Labrador tea/Feathermoss association on modal sites.

TABLE 3
PLANT ASSOCIATIONS OF THE BOREAL UPLANDS ECOREGION

PLANT ASSOCIATION	SITE DESCRIPTION	DOMINANT PARENT MATERIAL	DRAINAGE
Lodgepole Pine/Labrador Tea/ Feathermoss	Modal conditions	Dominantly morainal	Well to imperfect
Lodgepole Pine/Labrador Tea- Tall Bilberry	Upper elevation modal sites	Moraine over bedrock	Well to imperfect
Lodgepole Pine/Alder/Dewberry	Steeply sloping- seepage areas	Moraine over bedrock	Well to imperfect
Lodgepole Pine/Alder/Labrador Tea	Gently sloping seepage areas	Moraine over bedrock	Well to imperfect
Lodgepole Pine/Twisted Stalk/ Feathermoss	Level to very strong slopes	Colluvial and morainal veneers over bedrock	Moderately well
White Spruce/Feathermoss	Near climax stands	Morainal and colluvial	Well to imperfect
Black Spruce-Lodgepole Pine/ Labrador Tea-Tall Bilberry	Gently sloping modal sites	Morainal	Well to imperfect
Black Spruce/Horsetail/Sphagnum	Moist lower slopes and depressions	Moraine often with organic veneers	Moderately well to poor
Dwarf Birch/Sedge/Sphagnum	Wet depressional sites	Organic veneer	Imperfect to poor
Dry Meadow-Fluvial	Valley bottoms	Fluvial and moraine	Moderately well to poor
Trembling Aspen/Buffaloberry/ Showy Aster	Steep south aspects	Colluvium over bedrock	Well

Lodgepole pine Alder/Dewberry

Lodgepole pine/Labrador tea/Feathermoss

Aspen/Buffalo-berry/Showy aster

White spruce/Horsetail



Lodgepole pine/Alder/Labrador tea
Lodgepole pine/Alder/Dewberry

Lodgepole pine/Labrador tea/Feathermoss

Dwarf birch/Sedge/Sphagnum

Black spruce-Lodgepole pine/
Labrador tea-Tall bilberry

Black spruce/Horsetail/Sphagnum

Lodgepole pine/Labrador tea/
Tall bilberry

Figure 5: Schematic Profile of Landscape/Plant Association Relationships in the Boreal Uplands Ecoregion

1.4 Subalpine

The Subalpine Ecoregion (Ecoregion 6, Strong and Leggat, 1982) occurs in the southern portion of the study area (Figure 2). It is altitudinally situated above the Boreal Uplands and below the Alpine Ecoregion. Elevations range from approximately 1 280 to 2 000 asl.

Closed coniferous forest dominates the Subalpine landscape with open stands occurring only at higher elevations where "krummholtz" forest develops. Meadow and shrubland vegetation is prevalent only in cool, moist depressional areas.

The ecoregion has a Cordilleran climate characterized by cold snowy winters and showery cool summers. Specific climatic parameters based on climatic records within the study area are shown in Appendix E.

The topography varies from rolling plateau remnants to foothill ridges and sub-parallel mountain ranges. Materials are morainal, residual and colluvial.

Lodgepole pine dominates on modal sites at lower elevations. Engelmann x white spruce, Engelmann spruce and alpine fir are a common component of these stands and would be expected to be the successional species. The dominance of pine can be attributed largely to the extensive fire history of the area. Engelmann spruce and alpine fir become predominant at the mid and upper elevations of the Subalpine. This is probably due to the cooler, moister conditions encountered at higher elevations, which favor spruce and fir growth, as well as a lower

frequency of large fires where site conditions tend to be more moist. Understory vegetation reflects the change from a boreal to subalpine climate with white-flowered rhododendron becoming dominant in the shrub layer in many stands.

Grasslands are scattered through the ecoregion on upper portions of steep south-facing slopes. These are a result of exposure effects which preclude the growth of trees. Meadow and shrubland vegetation types are encountered in valley bottom locations usually near small drainage courses. In these instances the combination of abundant moisture and cold air drainage presents establishment of tree species.

There are 10 associations identified for the subalpine in this study (Table 4). A schematic profile diagram illustrating general relationships between associations is shown in Figure 6.

The lower elevation boundary of this ecoregion in the study area is considered to be where the Lodgepole pine/White-flowered rhododendron/Feathermoss association assumes dominance on modal sites. This occurs at approximately 1 280 m. The upper boundary is defined by the absence of tree species in the Alpine Ecoregion.

TABLE 4
PLANT ASSOCIATIONS OF THE SUBALPINE ECOREGION

PLANT ASSOCIATION	SITE DESCRIPTION	DOMINANT PARENT MATERIAL	DRAINAGE
Lodgepole Pine/White-Flowered Rhododendron/Feathermoss	Modal sites	Moraine and moraine veneers over bedrock	Well to moderately
Engelmann Spruce-Alpine Fir/White-Flowered Rhododendron/Feathermoss	Climax stands	Moraine and residual	Well to poor
Engelmann Spruce-Alpine Fir/Red Heather	Steep northerly slopes at higher elevations	Colluvium	Moderately well to well
Lodgepole Pine/Tall Bilberry/Five-Leaved Bramble	Modal sites at lower elevations	Moraine veneers over bedrock	Well to poor
Black Spruce-Lodgepole Pine/Tall Bilberry	Relatively moist sites at lower elevations	Moraine and saprolite	Moderately well to imperfect
Engelmann x White Spruce/Feathermoss	Northerly aspects	Colluvial, moraine, fluvial	Moderately well to well
Lodgepole Pine/Hairy Wild Rye	Steep south-facing slopes	Colluvial and morainal	Moderately well to rapid
Dwarf Birch/Sedge/Sphagnum	Wet valley bottoms and depressions	Organic, morainal and fluvial	Imperfect to poor
Dry Meadow-Fluvial	Relatively moist valley bottoms	Fluvial, morainal	Moderately well to poor
Subalpine Grassland	South-facing ridge tops	Residual	Rapid to well

Lodgepole pine/Tall bilberry/Five-leaved bramble/
Feathermoss
Black spruce-Lodgepole pine/Tall bilberry

Lodgepole pine/White-flowered Rhododendron/
Feathermoss

Lodgepole pine/Hairy wild rye

Engelmann spruce-Subalpine fir/
White-flowered Rhododendron

Lodgepole pine/Hairy wild rye

Dry meadow

White spruce/Feathermoss

Dry meadow

Engelmann spruce-Subalpine fir/Red heather
Engelmann spruce-Subalpine fir/White-flowered
Rhododendron

Alpine meadow

Lodgepole pine/Hairy wild rye



↑
N

Figure 6: Schematic Profile of Landscape/Plant Association Relationships in the Subalpine Ecoregion

1.5 Alpine

The Alpine Ecoregion (Ecoregion 7, Strong and Leggat 1982) occurs in the southwestern corner of the study area (Figure 2) generally above 2 000 m asl.

In the Lower Alpine, willow and dwarf birch communities and "islands" of krumholtz occur. The Middle Alpine is characterized by relatively continuous heather and snowbed communities, while the Upper Alpine is poorly vegetated due to the cool summer temperatures and exposure to wind. Rocky outcrops and stonefield lichen communities are typical of the Alpine Ecoregion.

This ecoregion has a more severe Cordilleran climate than the Subalpine. The overriding climatic elements which characterize the Alpine are strong winds, long winters, and cool summers. Below freezing temperatures are common, even during the warmest months. Precipitation is high during all months, with a tendency for greater precipitation during winter. As there is no overstory vegetation, the surface displays a highly variable microclimate. During summer, the climate of steep south-facing slopes differs markedly from that of the north-facing slopes. During winter, southwest to northwest-facing slopes may be completely snow-free, whereas east aspects or protected pockets may have snow cover several metres deep, possibly lasting well into summer or even year-round. Specific climatic data for stations within the Subalpine are given in Appendix E.

Vegetation data collected in the Alpine was not sorted into plant associations due to the small number of plots sampled. However, a listing of vegetation composition for specific plots is given in Volume II.

1.6 Montane

The area along the Smoky River up to its confluence with Sheep Creek in the southern portion of the study has a unique vegetation pattern that is not typical of the other ecoregions. The influence of chinook winds along the river valley has allowed the development of grassland communities intermixed with aspen and lodgepole pine stands which have understories reflecting dry site conditions. This area has been described as Montane (Figure 2) as it does resemble Montane conditions found in river valleys further south in the province in the Athabasca, North Saskatchewan and Bow River valleys.

Only two vegetation associations have been sampled in this area (Table 5). The grassland communities in the area were not sampled, however, they are relatively common on steep exposed slopes.

TABLE 5
PLANT ASSOCIATIONS OF THE MONTANE ECOREGION

PLANT ASSOCIATION	SITE DESCRIPTION	DOMINANT PARENT MATERIAL	DRAINAGE
Trembling Aspen/Prickly Rose/Hairy Wild Rye	Relatively dry sits	Fluvial, moraine, colluvium	Well
Lodgepole Pine-Trembling Aspen/ Bearberry	Dry south-facing slopes	Colluvium, moraine	Well

2. LAND CLASSIFICATION

The first level of division, the region, is based on major differences in elevation, relief and structural geology. Within the study area four major regions were defined (Figure 7).

1. Wapiti Plains
2. Western Alberta Plains
3. Rocky Mountains Foothills
4. Rocky Mountains

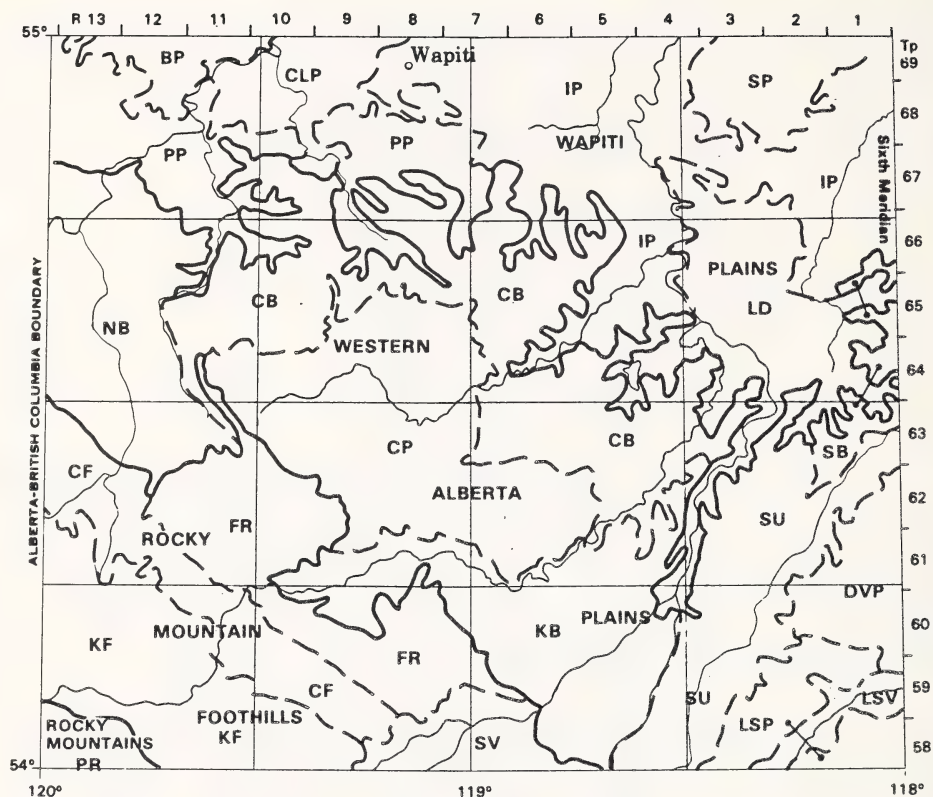
Each of these regions have been subdivided into subregions (ecodistricts) which are based on differences in patterns of relief, geology and geomorphology. Within the study area twenty such subdivisions have been identified.

The third stratification level recognized consists of 184 systems/ecosections. These are essentially landform, parent geologic material, vegetation subdivisions and are described within their respective subregions.

2.1 Wapiti Plains Region

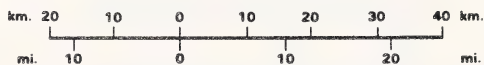
The northern portion of the study area lies within the Wapiti Plains Region (Figure 7). Elevations range from 550 m within the Smoky River valley to approximately 1 050 m along the British Columbia border.

The area is underlain structurally by the eastern limb of the broad, gently dipping Alberta syncline. Bedrock is of the Wapiti



DEEP BASIN STUDY AREA (N.T.S. BLOCK 83 L)

SCALE 1 : 1 000 000



REGIONS —————
SUBREGIONS - - - - -

WEST OF THE SIXTH MERIDIAN

REGIONS

ROCKY MOUNTAINS

WESTERN ALBERTA
PLAINS

SUBREGIONS

Park Ranges (PR)

Cutbank Benchlands (CB)

Cutbank Plateau (CP)

Deep Valley Plateau (DVP)

Kakwa Benchlands (KB)

Simonette Benchlands (SB)

Simonette Uplands (SU)

Little Smoky Plain (LSP)

Little Smoky Valley (LSV)

Narraway Benchlands (NB)

REGIONS

ROCKY MOUNTAIN
FOOTHILLS

WAPITI PLAINS

SUBREGIONS

Copton Foothills (CF)

Foothill Ridge (FR)

Kakwa Foothills (KF)

Smoky Valley (SV)

Beaverlodge Plain (BP)

Clairmont Plain (CLP)

Iosegun Plain (IP)

Latonnell Delta (LD)

Pinto Plain (PP)

Smoky Plain (SP)

Figure 7: Physiographic Regions and Subregions

Formation (Figure 3) and is masked by thick surficial materials. Bedrock exposures are common within major river valleys, namely the Smoky and Wapiti Rivers.

The general landscape is characterized by level to undulating topography with varied local relief of 10-50 m. Small upland areas are also present and extend up to 260 m above the plain. In addition, relief within the deeply incised river valleys varies from 90 to 200 m.

Surficial materials of the Plains region are dominantly glaciolacustrine and glaciofluvial sediments with significant amounts of till deposits. Minor amounts of eolian, organic and fluvial materials are also present.

The Wapiti Plains lies within the Boreal Mixedwood ecoregion and parts of the Boreal Foothills ecoregion. Aspen forests are dominant with lodgepole pine forests and black spruce/tamarack wetlands also being significant.

The Plains region has been subdivided into six subregions/ecodistricts. Topography, surficial materials and vegetation within each subregion are shown in Table 6.

Table 6

MAJOR CHARACTERISTICS OF THE SUBREGIONS IN THE WAPITI PLAINS

SUBREGION	TOPOGRAPHY	SURFICIAL MATERIALS	VEGETATION
Beaverlodge Plain*	Gently undulating to rolling plain	Glaciolacustrine, glaciofluvial veneers and organics	Aspen/Balsam poplar forest
Clairmont Plain*	Gently undulating plain with depressional lowlands	Glaciolacustrine, eolian, some glaciofluvial veneers and organics	Aspen/Balsam poplar forest - minor inclusions of spruce
Isoegun Plain*	Gently rolling plain	Glaciolacustrine, with some glaciofluvial and eolian veneers over till and glaciolacustrine	Aspen/Balsam poplar forest - minor inclusions of spruce and pine
Latornell Delta*	Level to inclined dissected deltaic plain	Glaciofluvial, glaciolacustrine, eolian veneers and blankets over till, some organics	Aspen/Balsam poplar/White spruce forest - inclusions of Black spruce/Lodgepole pine
Pinto Plain*	Subdued to rolling bedrock controlled plain	Moraine, some eolian veneers and blankets over till, glaciofluvial, organics and glaciolacustrine veneers	Aspen/Lodgepole pine forest - inclusions of spruce/tamarack are common
Smoky Plain*	Depressional to gently undulating plain	Organic, eolian and some glaciolacustrine	Black spruce-Tamarack/Sedge - with Aspen/Balsam poplar, some lodgepole pine

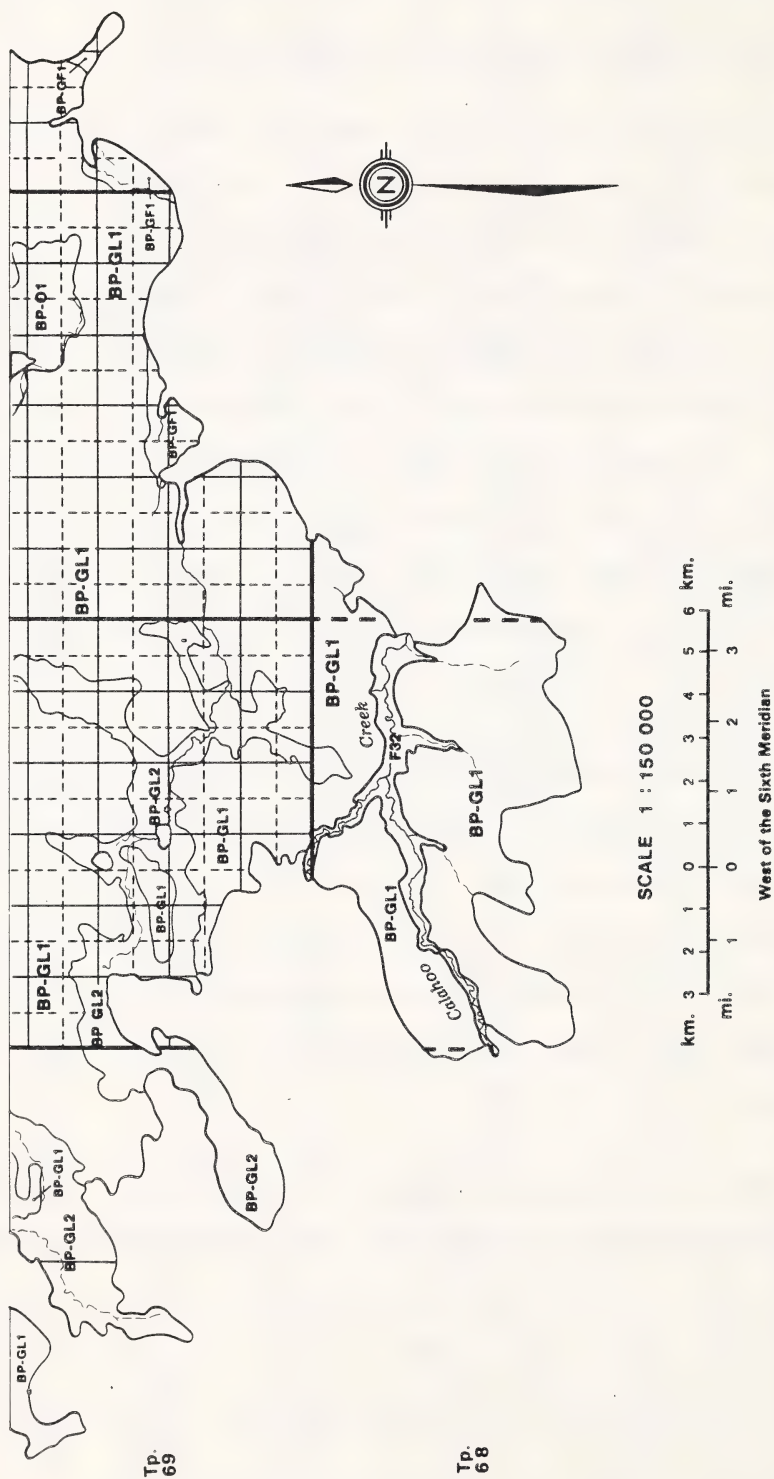
*NOTE: Bedrock across the region is gently dipping strata of the Wapiti Formation

2.1.1 Beaverlodge Plain Subregion (Ecodistrict)

This plain occurs north of the Wapiti River in the northwestern portion of the study area (Figure 8). The subregion/ecodistrict is generally underlain by gently dipping bedrock of the Wapiti Formation which slopes to the northeast. This bedrock is masked by thick glacial deposits resulting in a gently undulating to rolling glaciolacustrine plain. Elevations across much of the subregion range from 730 to 920 metres. The majority of the area is drained by tributary streams of the Wapiti River which cut across the southern portion of the subregion. The vegetation cover across the subregion reflects conditions found within the Boreal Mixedwood Ecoregion, with aspen dominating the forest stands.

The major deposits across the landscape are glaciolacustrine in nature and were initially laid down during the early stages of Glacial Lake Peace. These deposits are generally fine-textured and slightly stony as a direct result of minor readvances of Continental ice in the area. Mature seral aspen forests are dominant on these materials, with the understory vegetation reflecting the varied local drainage conditions.

Significant surficial deposits in the subregion are reflective of post glacial lake environment. Coarser textured glaciofluvial deposits occur as terraces along the upper valley portions of the Wapiti River and as thin veneers adjacent to former minor glacial meltwater channels which criss-cross the area. These deposits support



a varied forest cover depending on drainage conditions. Lodgepole pine occupies drier sites and a mixture of aspen/balsam poplar occupy other varied portions in the landscape.

Numerous organic fens occupy most of the depressional areas within the subregion. Sedge and sphagnum peats support both tamarack and black spruce communities dependent on the depth of the organic deposits.

The Beaverlodge Plain subregion is divided into four distinctive ecosection/systems consisting of glaciofluvial terraces, glaciolacustrine plain, glacial meltwater channels and organic depressions (Table 7).

A generalized description of each ecosection/system with accompanying schematic diagrams follows. In addition, two fluvial systems have been identified within the subregion (F32, F33). These systems are discussed in section 2.5 of Volume 1 of this report.

Table 7
ECOSECTIONS/SYSTEMS OF THE BEAVERLODGE PLAIN

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
BP-GF1	Inclined glaciofluvial terraces	Gravelly sand	Lodgepole pine forest
BP-GL1	Rolling glaciolacustrine plain	Glaciolacustrine clay-loam with sandy overlays	Aspen and balsam poplar forest
BP-GL2	Depressional glacial meltwater channel	Peat and glaciolacustrine sandy clay	Wet shrubland and aspen-balsam poplar forest
BP-01	Depressional glaciolacustrine basin	Peat	Wet shrubland and open black spruce-larch forest

Physical Conditions:

These level to gently inclined glaciofluvial terraces (Figure 9) bordering the Wapiti River consist of coarse-textured sand and gravel deposits. Interbedding of finer-textured materials creates small pockets of imperfect drainage. These terraces are currently being excavated commercially for gravel.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GF	gS	0-20	1-2	E.EB	Lodgepole pine/Blueberry/Lichen
			2	BR.GL, E.EB	Aspen/Rose/Peavine

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The low water storage capacity of coarse-textured, rapidly drained outwash deposits causes lodgepole pine forest to predominate within this ecosection. Aspen forest only occurs adjacent to creeks where coarse-textured materials have been eroded away.

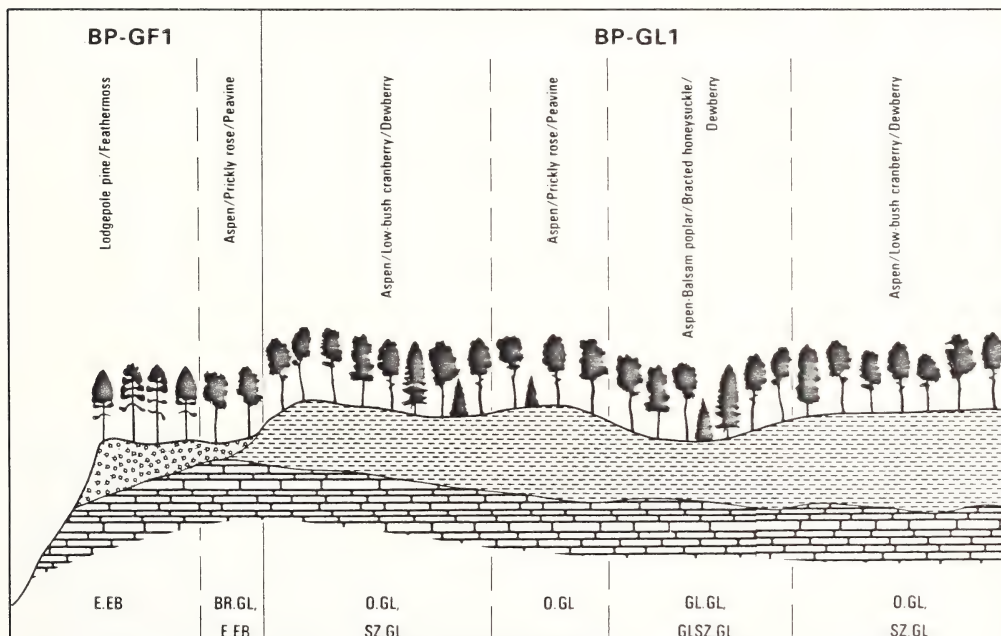


Figure 9: Schematic Diagram of Ecosections BP-GF1 and BP-GL1

Physical Conditions:

This very gently undulating to rolling glaciolacustrine plain (Fig. 9) occurs north of Calahoo and Sylvester Creeks. It consists mainly of moderately fine to fine-textured, slightly stony glaciolacustrine sediments. Some minor occurrences of thin glaciofluvial deposits occur adjacent to Smith Creek, indicating that this was a short-lived glacial meltwater channel. Small accumulations of sedge and sphagnum peat have developed in depressional terrain. Beach deposits occur at approximately 840 m, marking the upper level of Glacial Lake Peace.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL	$\frac{SCL}{CL}$	2-9	2-3	O.GL, SL.GL	Aspen/Low-bush cranberry/Dewberry
$\frac{GFvb}{GL}$	$\frac{SL}{CL}$	2-9	4	GL.GL, GLSZ.GL, GLE.EB	Aspen/Balsam poplar/Bracted honeysuckle/Dewberry

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Most of the forest vegetation in this ecosection has been cleared for agricultural use. The composition of remaining forest stands is controlled by topography and drainage, with aspen forest found on well-drained knolls and a mixed aspen-balsam poplar forest on lower slopes.

Physical Conditions:

These nearly level to depressional glacial meltwater channels (Fig. 10) are now occupied by Smith and Diamond Dick Creeks. Imperfectly to poorly drained glaciolacustrine sediments are the principal surficial materials with significant amounts of organic accumulations occurring in depressional terrain. Most glaciofluvial materials were eroded by flowing meltwaters.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
Ovb GL	Mesic SCL	0-2	5-6	Peaty Gleysols, Mesisols	Tamarack-Black spruce/Sedge/Sphagnum
GL	SCL	0-2	4-5	GL.GL, GLSZ.GL, Gleysols	Aspen-Balsam poplar/Bracted honeysuckle/Dewberry
GFvb GL	SL SCL	0-2	2-4	BR.GL, E.EB, GLE.EB	Aspen-Balsam poplar/Bracted honeysuckle/Dewberry

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Depressional topography and poor drainage cause open fen vegetation to occur over most of this ecosection. Deciduous forest stands are confined to coarse-textured deposits on slopes, where seepage and underlying glaciolacustrine materials keep soil moisture levels high.

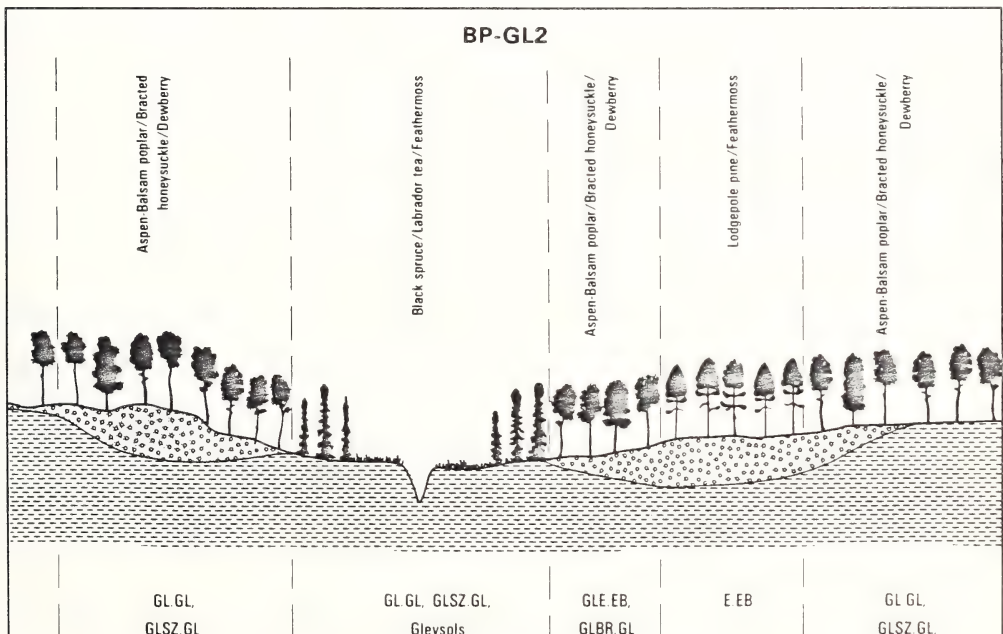


Figure 10: Schematic Diagram of Ecosection BP-GL2

Physical Conditions:

This system is a nearly level to depressional fen (Fig. 11). Organic accumulations derived from sedge and sphagnum peats are underlain at depth by fine-textured glaciolacustrine sediments. The slow permeability of glaciolacustrine materials has led to perched water tables and the development of floating bogs and small lakes.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
Ovb GL	Mesic CL	0-2	5-6	Peaty Gleysols, Mesisols	Tamarack-Black spruce/Sedge/Sphagnum Black spruce/Labrador tea/Feathermoss
0	Mesic	0-2	6	Mesisols	Tamarack-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

A mixture of shrubby and treed fen vegetation occurs on this poorly drained lowland surrounding Twin Lakes. Lack of coarse-textured overlays with deciduous forest cover distinguishes it from BP-GL2.

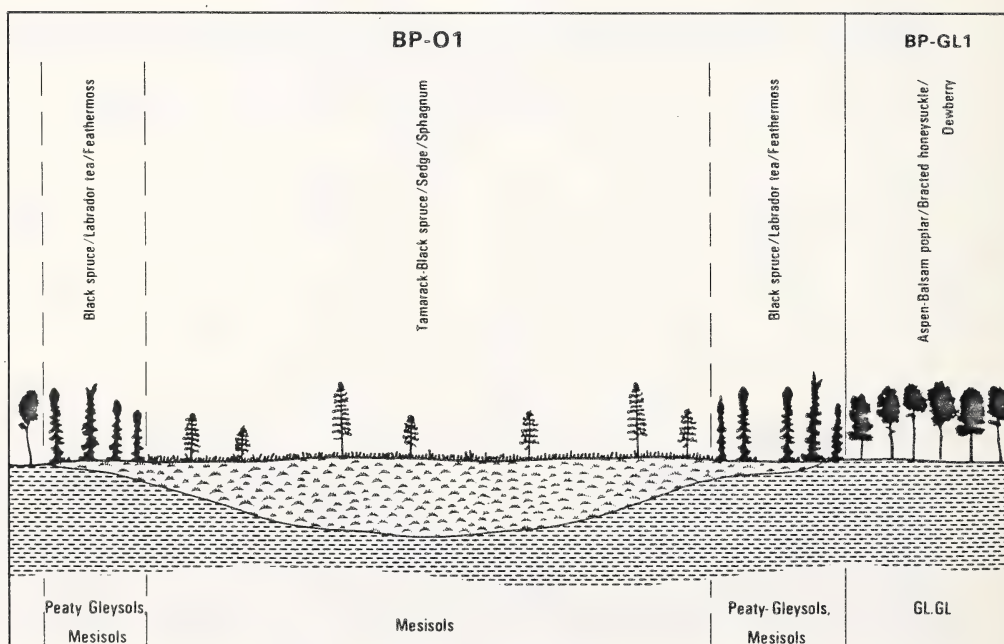


Figure 11: Schematic Diagram of Ecoregion BP-O1

2.1.2 Clairmont Plain Subregion (Ecodistrict)

The Clairmont Plain occupies a portion of the landscape east of the Wapiti River (Figure 12). Bedrock of the Wapiti Formation underlies this subregion/ecodistrict but is masked by thick glacial deposits except for minor local exposures within the Pinto Creek valley. Elevations range from 610 m to 820 m across the gently undulating to depressional glaciolacustrine plain which makes up the landscape. Vegetation reflects the conditions found within the Boreal Mixedwood Ecoregion, however, the high variability in surficial deposits produces a complex vegetation mosaic.

The dominantly fine-textured glaciolacustrine deposits originated during the early stages of Glacial Lake Peace and are commonly overlain by glaciofluvial and eolian materials as a result of delta building processes. These coarse-textured overlays combined with underlying fine-textured materials results in varied drainage conditions across the subregion. This is reflected in the vegetation cover and limits the occurrence of modal sites. Vegetation found on these glaciolacustrine materials varies from mature seral aspen to black spruce dependent on soil moisture conditions.

In addition to overlays, more extensive deposits of glaciofluvial and eolian materials are found throughout the subregion. Glaciofluvial materials in the form of terrace and sheet wash deposits are found along the major streams. Some of these deposits have been reworked by eolian processes into extensive dune fields. Vegetation on these coarse textured and better drained sites ranges from a mixture of

seral aspen/balsam poplar forest to lodgepole pine stands.

As with a significant portion of most of the subregions within the Wapiti Plains, organic accumulations are generally found in association with other surficial materials. Occupying depressional locations, these sites support tamarack and black spruce communities.

The Clairmont Plain subregion is divided into five ecosection/systems; dune field, glaciofluvial terrace, glaciolacustrine plain, depresional glaciolacustrine plain, and organic depressions (Table 8). Descriptions and accompanying schematic diagrams of each ecosection/system follows.

The subregion has also been identified as having four fluvial systems (F18, F21, F31, F32) which cross the landscape. Their characteristics are discussed in section 2.5 of Volume 1.

Table 8
ECOSECTIONS/SYSTEMS OF THE CLAIRMONT PLAIN

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
CLP-E1	Ridged dune plain	Eolian sand and peat	Aspen and lodgepole pine forest, black spruce muskeg
CLP-GFGL1	Eroded glaciofluvial terrace	Loamy glaciofluvial sand and peat	Lodgepole pine and aspen forest, sedge meadows
CLP-GL1	Undulating glaciolacustrine plain	Glaciolacustrine clay and peat	Aspen and white spruce forest, black spruce muskeg
CLP-GL2	Undulating glaciolacustrine plain	Glaciolacustrine clay with sandy overlays and peat	Aspen, lodgepole pine and open black spruce forest
CLP-01	Depressional glaciolacustrine basin	Peat	Sedge and shrub-dominated muskeg

Physical Conditions:

This system (Fig.13) is located south of the Wapiti River and is dissected by both Iroquois and Pinto Creeks. Surficial materials are dominated by eolian sands which occur as either parabolic and longitudinal dunes or as eolian veneers and blankets overlying finer-textured glaciolacustrine sediments. Organic accumulations are interspersed between sand dunes.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
$\frac{E_{vb}}{GL}$	$\frac{S-LS}{CL}$	0-2	2-3 3-4	E.EB, BR.GL BR.GL, GLBR.GL	Aspen/Rose/Pea vine Aspen/Low-bush cranberry/Dewberry
E	S	0-9	1	E.EB, E.DYB	Lodgepole pine/Blueberry/Lichen
$\frac{O_{vb}}{GL}$	$\frac{Mesic}{CL}$	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Labrador tea/Feathermoss Tamarack-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The thickness and conformation of sand deposits controls the patterns of soil moisture and vegetation. Large dune fields have lodgepole pine forest on rapidly drained dune crests and slopes, with shrubby black spruce muskeg in the poorly drained areas between dunes.

Thin sheet sand deposits are not as dry as dunes because underlying clay deposits are near the surface. These deposits support a mixture of aspen and balsam poplar communities.

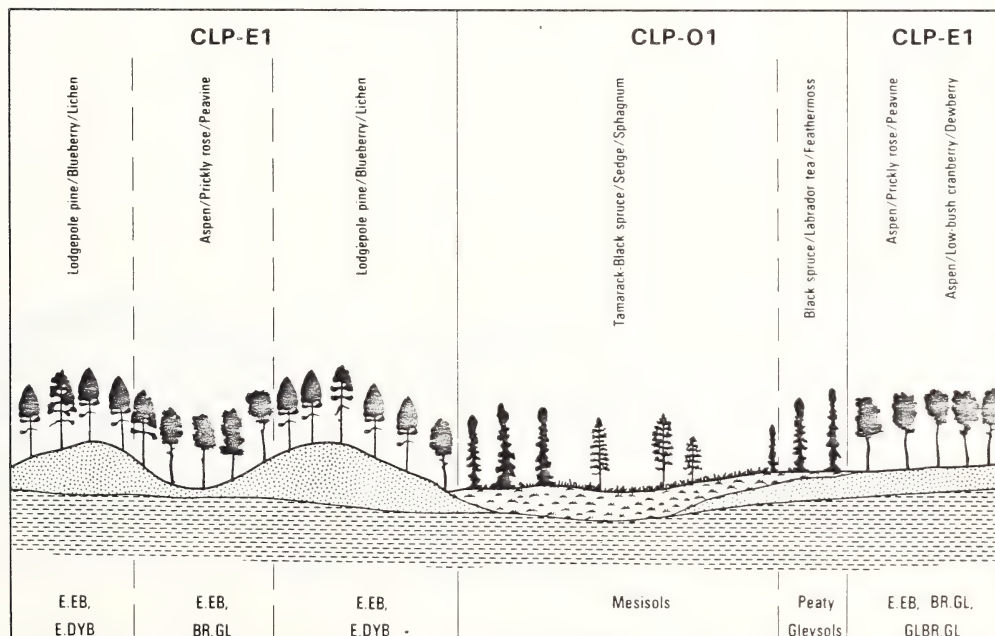


Figure 13: Schematic Diagram of Ecosections CLP-E1 and CLP-O1

Physical Conditions:

This is a nearly level, highly eroded glaciofluvial terrace bordering the south side of the Wapiti River (Fig. 14). Surficial materials include coarse-textured glaciofluvial sands and gravels in association with finer-textured glaciolacustrine sediments. (Glaciolacustrine sediments are the result of erosion following deposition by glacial meltwater streams which deposited these finer textured sediments in oxbow-like features). Organic veneers commonly overlie glaciolacustrine deposits.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GF, GFvb GL	kLS, kLS CL	0-2	1 2	E.EB, BR.GL, PZ.GL	Lodgepole pine/Blueberry/Lichen Aspen/Rose/Pea vine
Ov GL	Mesic CL	0-2	5-6	Peaty Gleysols, Mesisols	Tamarack-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The vegetation pattern closely reflects the pattern of deposition of glaciofluvial sands. Lodgepole pine forest occurs in a braided pattern on thick, well drained sand deposits, while poorly drained channels support sedge-dominated wetlands.

Moisture conditions are less extreme on sloping sheet sand deposits, and aspen forest is characteristic.

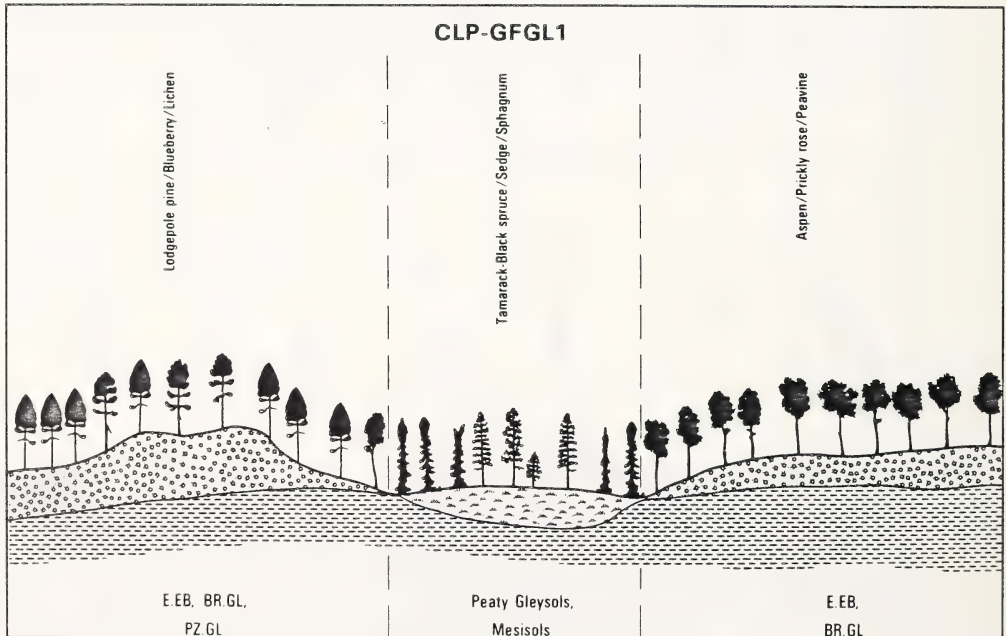


Figure 14: Schematic Diagram of Ecosection CLP-GFGL1

Physical Conditions:

This nearly level to gently undulating glaciolacustrine plain (Fig. 15) is dissected by Pinto Creek and occurs immediately south of its confluence with the Wapiti River. Surficial materials consist of moderately fine to fine-textured glaciolacustrine sediments. Organic accumulations occur locally in depressional terrain and thin glaciofluvial veneers are common west of Iroquois Creek.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL, GFv GL	SL CL	2-5	2-3	SZ.GL, O.GL	Aspen/Low-bush cranberry/Dewberry- Balsam poplar-Aspen/Bracted honey- suckle/Dewberry
GL	CL	0-5	4	GLSZ.GL, GL.GL	White spruce/Bracted honeysuckle/ Dewberry
Ovb GL	Mesic CL	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Labrador tea/Feathermoss

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The pattern of vegetation on uplands reflects the prevalence of seepage, with aspen forest on well-drained sites and a mixed aspen-balsam poplar forest in seepage tracks. Poorly drained lowlands support a mixture of deciduous shrubland and black spruce stands.

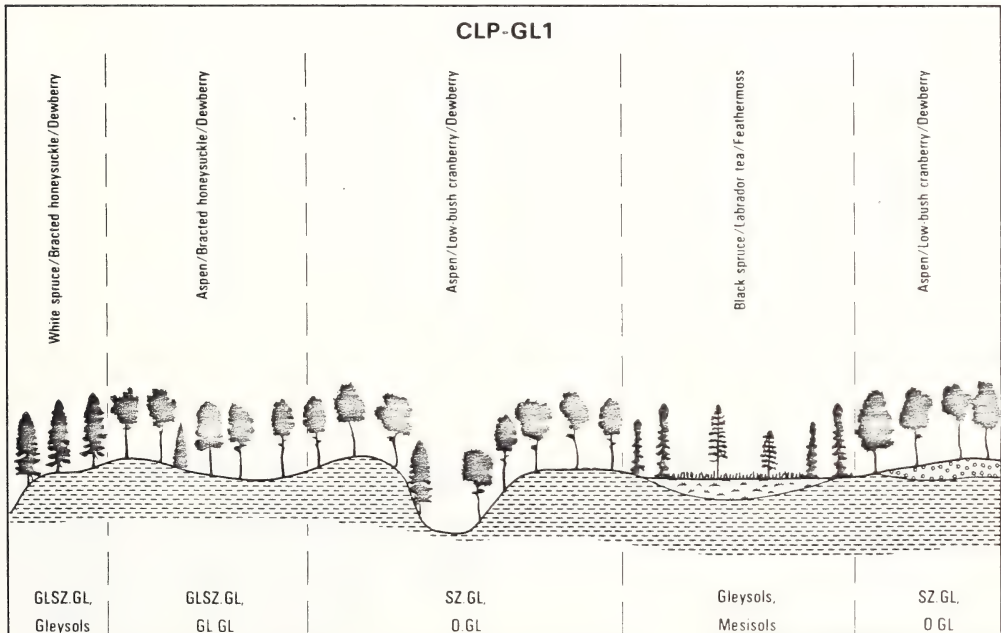


Figure 15: Schematic Diagram of Ecoregion CLP-GL1

Physical Conditions:

This nearly level to depressional glaciolacustrine plain (Fig. 16) occurs between the Wapiti River and Pinto Creek. Imperfectly to poorly drained glaciolacustrine sediments are overlain by ridged glacio-fluvial and eolian deposits of variable thicknesses. Organic accumulations occur between the ridges.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL	CL/C	0-2	4-5	Gleysols	Black spruce/Labrador tea/Feathermoss
$\frac{Eb/Gfb}{GL}$	$\frac{S}{CL/C}$	0-15	1-2	E.EB, BR.GL	Lodgepole pine/Blueberry/Lichen Aspen/Rose/Pea vine-Balsam poplar
$\frac{Ev/GFv}{GL}$	$\frac{S}{CL/C}$	0-2	4	GLBR.GL, GL.GL	Aspen/Bracted honeysuckle/Dewberry
$\frac{Ovb}{GL}$	$\frac{Mesic}{CL/C}$	0-2	6	Mesisols	Tamarack-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

A complex vegetation pattern is produced by variation in the depth of coarse-textured overlays. Thick, rapidly drained sand deposits in the eastern part of the ecosection support lodgepole pine forest, while aspen forest predominates on thinner deposits in the west.

Sedge meadows and open black spruce forests are found on poorly drained lowlands.

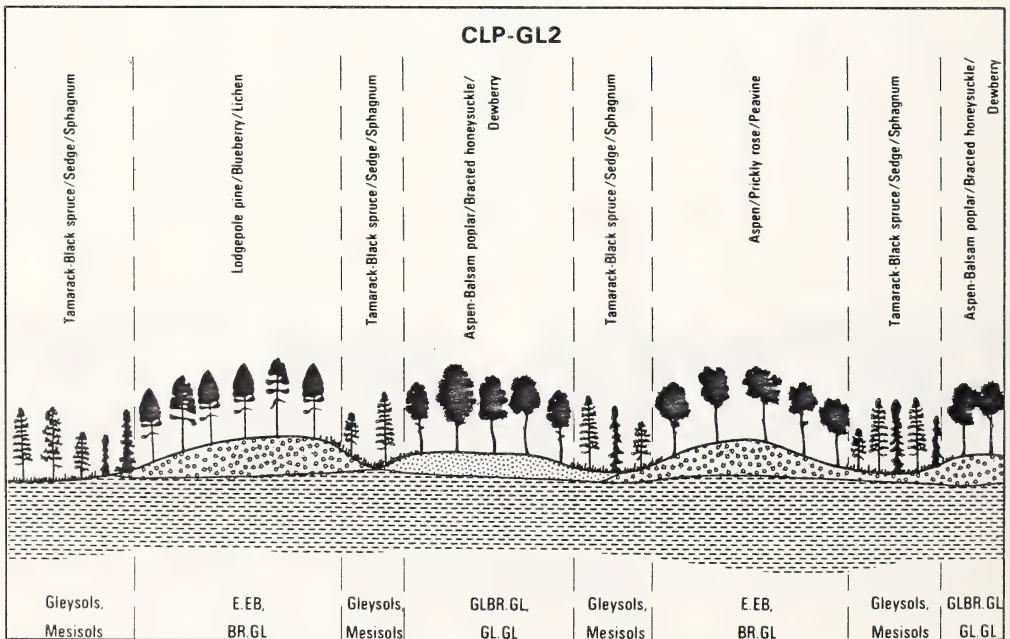


Figure 16: Schematic Diagram of Ecosection CLP-GL2

Physical Conditions:

These low-lying depressional areas (Fig. 13) consist of bogs which occur west of Pinto Creek and south of the Wapiti River. Organic accumulations are derived from sedge and sphagnum peats and are underlain by fine-textured glaciolacustrine sediments which restrict groundwater percolation. These accumulations may exceed 2 m in depth.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
O, Ovb GL	Mesic CL	0-2	5-6	Mesisols, peaty Gleysols	Tamarack-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Excessive soil moisture restricts development of vegetation to a mixture of sedge and shrub-dominated wetlands in which tamarack is the most common tree species. The few remaining dunes support lodgepole pine forest.

2.1.3 Isoegun Plain Subregion (Ecodistrict)

Found within the central portion of the Wapiti Plains Region, the Isoegun Plain (Figure 17) consists of an extensive gently rolling lacustrine plain sloping to the north-northeast. Bedrock strata of the Wapiti Formation underlies the sloping landscape but is masked by thick glacial materials which give the subregion/ecodistrict a relief of approximately 175-200 metres. The subregion lies entirely within the Boreal Mixedwood Ecoregion with aspen forest dominating the landscape.

Although glaciolacustrine sediments dominate much of the landscape, overlays of glaciofluvial sediments are common. This is a direct result of extensive delta building processes during the evolution of Glacial Lake Peace. These coarse-textured overlays combined with fine-textured underlying glaciolacustrine materials have given rise to varied drainage conditions. Vegetation over most of this landscape consists of aspen forest often in association with balsam poplar.

The variety of materials found around the margin of the subregion are indicative of a complex glacial history. Sediments associated with meltwater channels are common, along with remnant deltaic sands which have been reworked by eolian processes. Most of these deposits support a varied association of aspen/balsam poplar which reflects the influence of underlying fine-textured materials. Where the coarse-textured glaciofluvial and eolian materials are deeper, vegetation often consists of lodgepole pine forest.

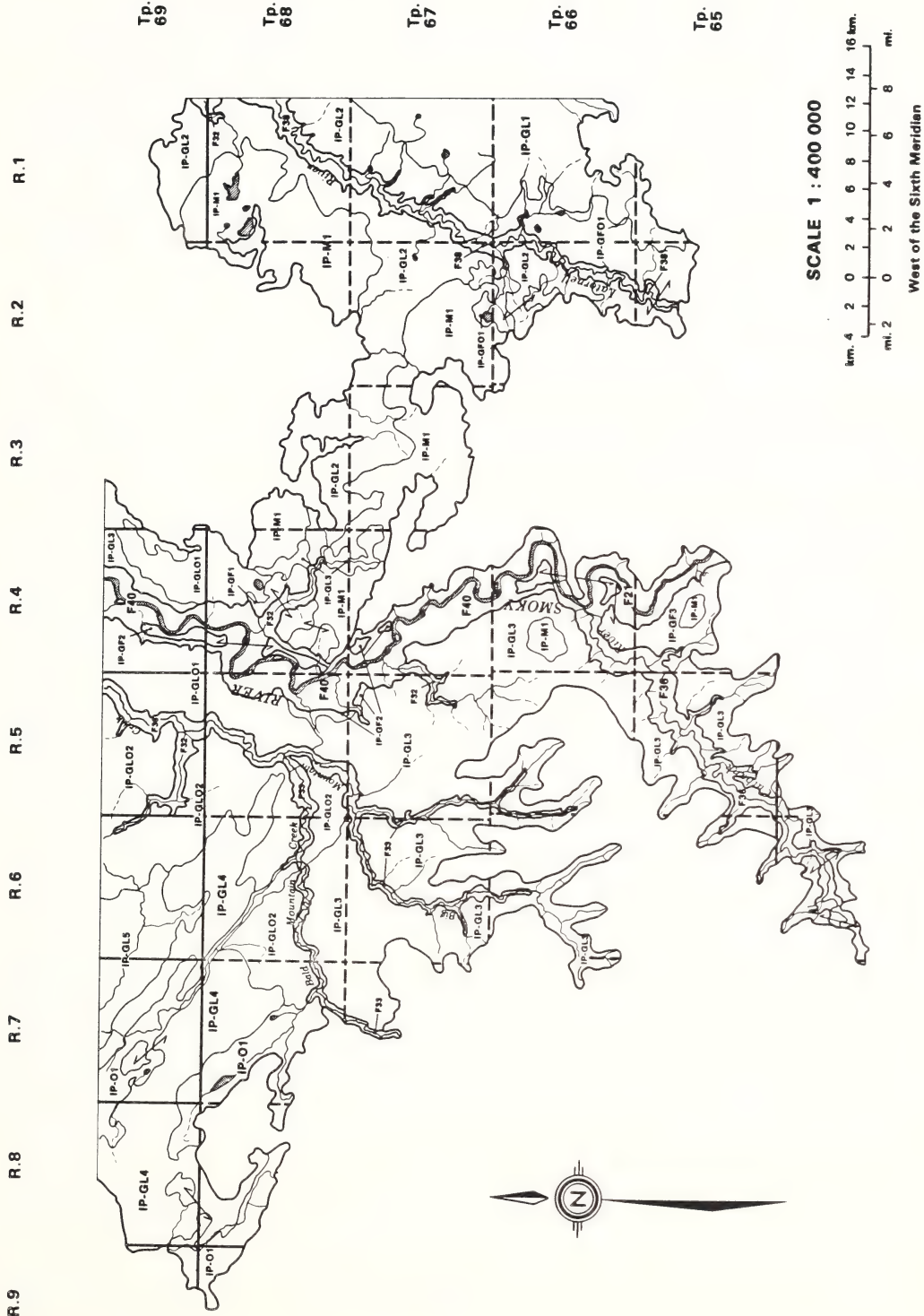


Figure 17: Iosegun Plain Subregion (IP)

Till deposits occur locally around the southern edge of the former lake basin. These deposits are often covered by thin glaciofluvial, eolian and glaciolacustrine sediments. Associated shoreline features are common in these areas and indicate fluctuations in lake levels during its brief history. Vegetation in these areas tends to be complex and consists of aspen/balsam poplar, often in association with white/black spruce.

Organic deposits are common throughout the subregion and are associated with all surficial materials. Vegetation is commonly black spruce and tamarack.

The Isoegun Plains subregion is divided into thirteen ecosection/systems (Table 9) which reflect the complex nature of landscape found within this portion of the Wapiti Plains region. Six fluvial systems cross the subregion (F21, F32, F33, F36, F38, F40). They are identified and discussed in section 2.5, Volume 1 of this report.

Table 9
ECOSECTIONS/SYSTEMS OF THE ISOEGUN PLAIN

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
IP-GF1	Level glaciofluvial terraces	Glaciofluvial sand and silt, and peat	Aspen and balsam poplar forest, black spruce muskeg
IP-GF2	Undulating glaciofluvial terraces	Glaciofluvial sand and gravel	Aspen forest
IP-GF3	Undulating outwash plain	Glaciofluvial silt and sand, peat	Aspen-balsam poplar, lodgepole pine and open black spruce forest
IP-GF01	Gently, inclined glaciofluvial delta	Glaciofluvial silt and sand, peat	Aspen and balsam poplar forest, black spruce and larch muskeg
IP-GL1	Rolling glaciolacustrine plain	Glaciolacustrine clay and peat	Aspen-balsam poplar and open black spruce forest
IP-GL2	Gently undulating glaciolacustrine plain	Glaciolacustrine clay, with sand and peat overlays	Aspen, balsam poplar, white spruce and open black spruce forest
IP-GL3	Undulating glaciolacustrine plain	Glaciolacustrine silt and clay	Aspen, balsam poplar and white spruce forest
IP-GL4	Gently inclined bedrock ridge	Glaciolacustrine silt and clay	Aspen and balsam poplar forest, black spruce muskeg
IP-GL5	Level glaciolacustrine plain	Glaciolacustrine clay and and eolian silt, peat	Aspen and balsam poplar forest, shrubby muskeg
IP-GL01	Undulating glaciofluvial delta	Glaciolacustrine clay overlain by sand and silt, and peat	Aspen and lodgepole pine forest, sedge and shrub muskeg
IP-GL02	Level glaciolacustrine plain	Glaciolacustrine clay overlain by silt, and peat	Aspen, balsam poplar and white spruce forest, shrubby and black spruce muskeg
IP-M1	Rolling ridges	Silt and sand over sandy clay till	Aspen and balsam poplar forest
IP-01	Glacial meltwater channel	Peat	Sedge meadows, shrubland and open black spruce-larch forest

Physical Conditions:

This is a complex of nearly level glaciofluvial terraces which are located 90-120 m above the valley floor (Fig. 18). Materials consist of interbedded glaciofluvial sands and silts, which are underlain by fine-textured till or glaciolacustrine sediments. Imperfectly to poorly drained conditions predominate because of fine-textured underlying materials combined with groundwater discharge from adjacent uplands. These organic deposits have accumulated in poorly drained terrain.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GF	S-SiCL	0-2	4	GLE.EB	Aspen-Balsam poplar/Bracted honeysuckle/Dewberry
Ov GF	Mesic SiCL	0-2	5-6	Gleysols, Mesisols	Tamarack-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

A mixed forest of aspen and balsam poplar covers most of this ecosection. The high incidence of balsam poplar reflects an abundance of soil moisture because of seepage and underlying fine-textured materials that impede percolation.

A few small ponds that have infilled with peat support sedge meadows and black spruce stands.

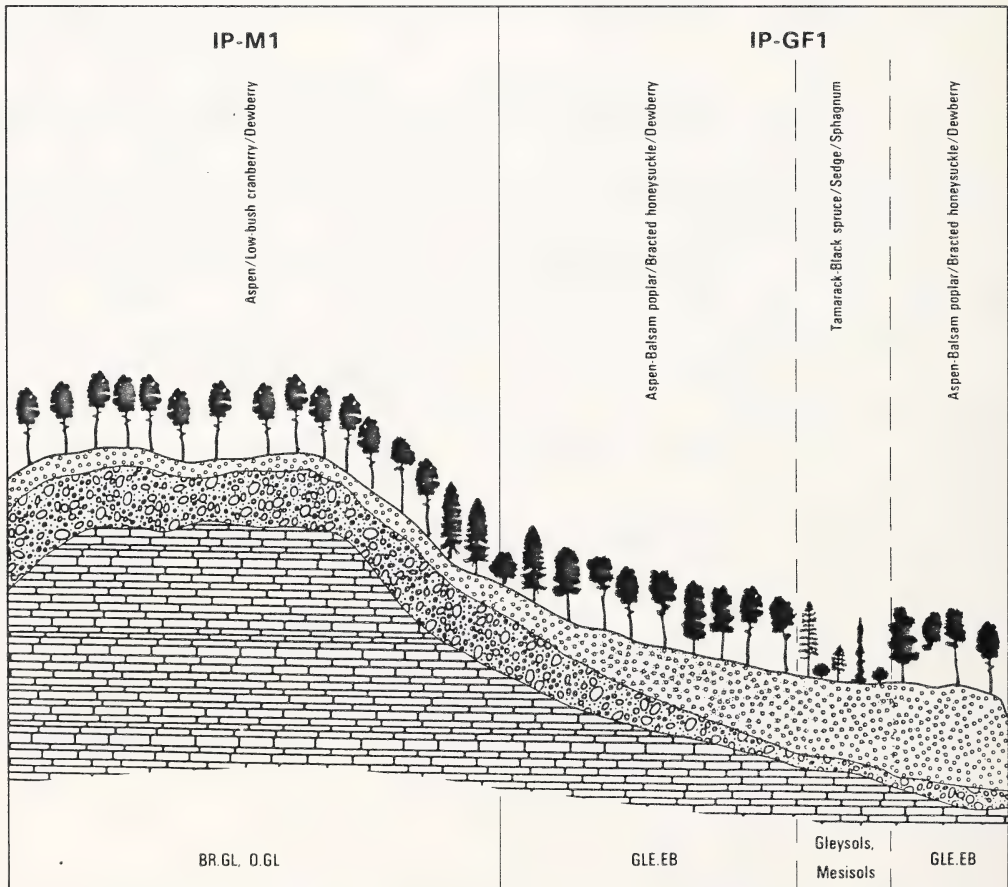


Figure 18: Schematic Diagram of Ecosections IP-GF1 and IP-M1

Physical Conditions:

This is a series of level to gently undulating glaciofluvial terraces located 15-120 m above the present day floodplain of the Smoky River (Fig. 19). Materials consist of interbedded sand and gravel deposits of variable thickness. These deposits are commonly overlain by a thin (2-10 cm) veneer of glaciolacustrine sediments. This sequence of surficial deposits indicates that there were several episodes of meltwater discharge. Gravel is currently being extracted from the northernmost of these terraces.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GF		0-2	2-4	O.GL, GL.GL	Aspen/Hazel/Wild sarsaparilla
$\frac{CLV}{GF}$	$\frac{CL}{S}$	0-2	2	O.GL	Aspen/Low-bush cranberry/Dewberry

Ecoregion: Boreal Mixedwood

Ecological Conditions:

These terraces are covered with aspen forest; the lower incidence of balsam poplar compared to IP-GL1 is a reflection of the greater depth of coarse sand and gravel and lack of interbedded finer materials.

A few relic oxbows support fen vegetation dominated by sedges and willows.

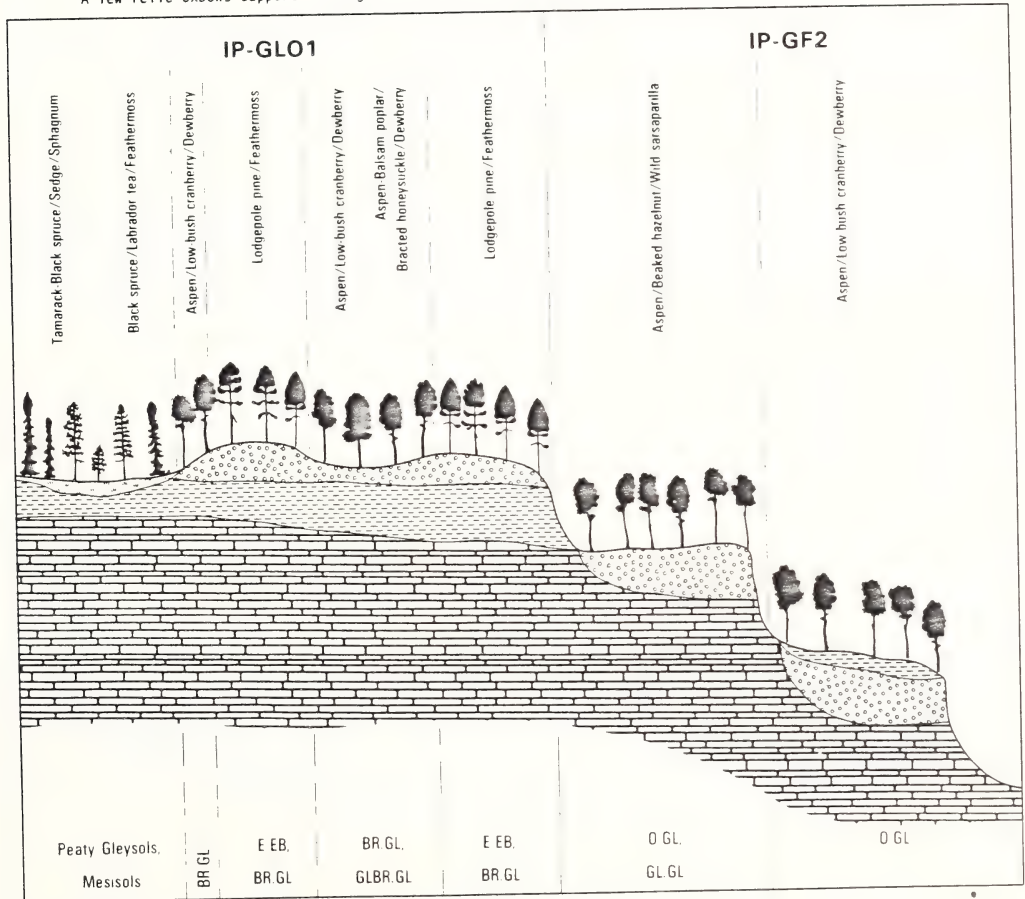


Figure 19: Schematic Diagram of Ecosystems IP-GF2 and IP-GLO1

Physical Conditions:

This level to gently undulating outwash plain is located near the confluence of the Smoky and Cutbank Rivers (Fig. 20). Thick, medium to coarse-textured glaciofluvial materials overlie bedrock which is very prone to slumping. Thin accumulations of sphagnum peat overlie these deposits adjacent to CB-M3 where seepage is pronounced. Drainage is highly variable with well-drained conditions prevailing in the north.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GF	Si-S	2-6	2-3	E.EB	Aspen/Low-bush cranberry/Dewberry, Aspen-Balsam poplar/Bracted honey-suckle/Dewberry
			2	E.EB	Lodgepole pine/Feathermoss
			4-5	GLE.EB, Gleysols	Black spruce-Lodgepole pine/ Feathermoss
Ovb GF	Mesic SIL	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Feathermoss/Tamarack- Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The vegetation pattern is influenced by variation in the thickness of glaciofluvial sands and subtle differences in topography. Mixed aspen-balsam poplar forest occurs on the nearly level northern portion where sand deposits are thin. In the southern portion there is a gradient that reflects increasing moisture availability, with lodgepole pine forest on upper slopes, pine-black spruce forest on lower slopes and a mixture of open and closed black spruce forest on poorly drained lowlands.

Physical Conditions:

This is a nearly level to gently inclined glaciofluvial delta that has been dissected by the Latonell River (Fig. 21). Surficial materials consist of glaciofluvial silts and sands which were deposited over finer-textured glaciolacustrine sediments. Extensive accumulations of poorly drained sedge and sphagnum peat have developed in depressional topography.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GF	Si-S	5-9	2-3	E.EB, BR.GL	Aspen/Low-bush cranberry/Dewberry
$\frac{GFvb}{GL}$	$\frac{Si}{CL}$	0-5	3-4	BR.GL, O.GL, GLBR.GL, GL.GL	Aspen/Balsam poplar/Bracted honeysuckle/Dewberry
O	Mesic	0-2	6	Mesisols	Larch/Black spruce/Sedge/Sphagnum
$\frac{Ovb}{GL}$	$\frac{Mesic}{CL}$	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Labrador tea/Feathermoss Larch-Black spruce/Sedge/sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

A sharply defined vegetation pattern is produced by abrupt changes in soil drainage. Relatively well-drained islands of glaciofluvial sand support a mixture of aspen and aspen-balsam poplar forest. Poorly drained peats are characterized by open black spruce and larch communities.

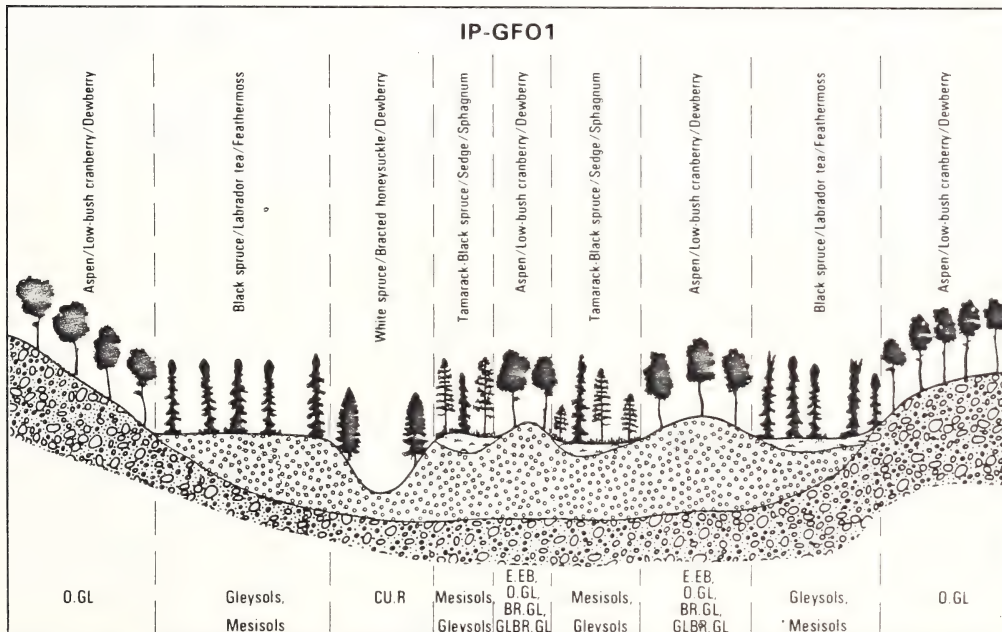


Figure 21: Schematic Diagram of Ecoregion IP-GF01

Physical Conditions:

This system represents part of the shoreline of Glacial Lake Peace which abuts the till-covered uplands of the Simonette Benchlands (Fig. 22). The predominant surficial materials are moderately fine-textured glaciolacustrine sediments which overlie undulating to gently rolling till deposits. Coarse-textured beach deposits occur locally along the margins of the former lake. In addition, glaciofluvial veneers often cover glaciolacustrine sediments.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL	CL	0-2	4	GL.GL, GL.SZ.GL	Aspen/Balsam poplar/Bracted honey-suckle/Dewberry
GL, GLvb, M M	SiC CL	2-6	2-3	0.GL SZ.GL	Aspen/Low-bush cranberry/Dewberry
Ovb M	Mesic CL	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Labrador tea/Sphagnum Larch/Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Groundwater discharge from the adjacent Simonette Benchlands has a major influence on the vegetation pattern. Imperfectly drained seepage tracks are very common and support a mixed aspen-balsam poplar forest. White spruce stands are often found in these environments on lower slopes, while pure aspen forest is confined to well-drained sites on upper slopes.

Sedge and black spruce dominated wetlands are not common because prevailing slopes limit ponding of groundwater.

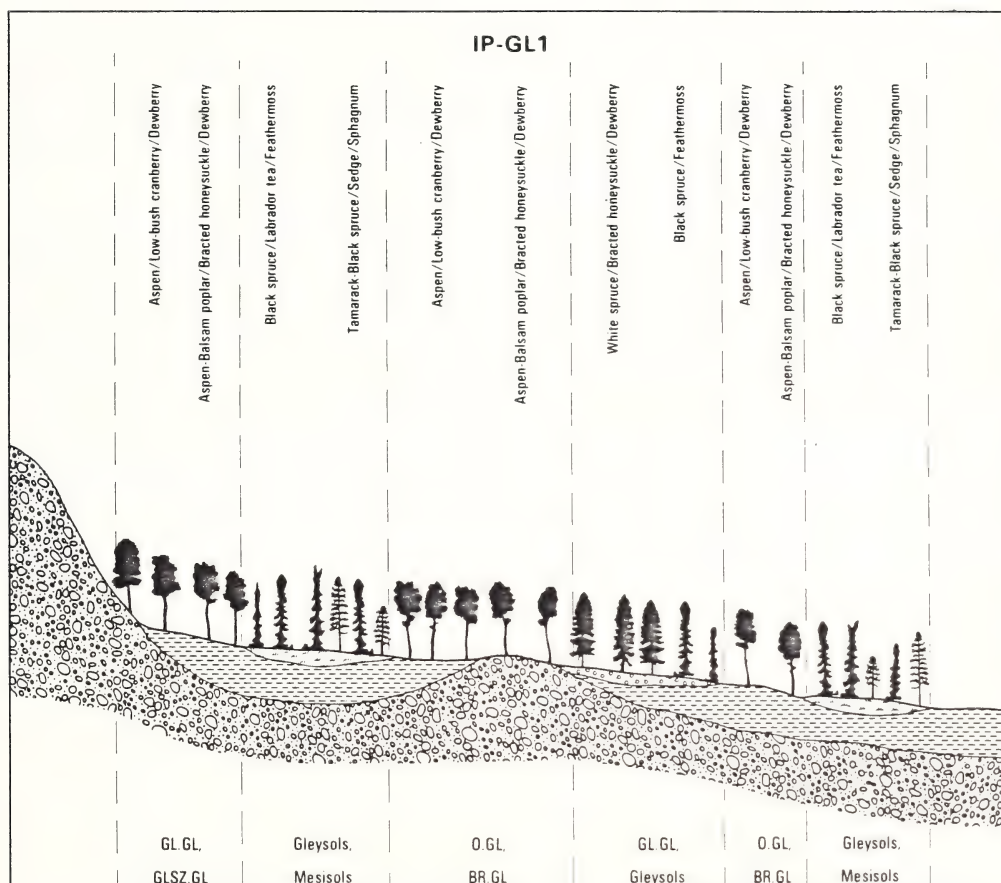


Figure 22: Schematic Diagram of Ecosection IP-GL1

Physical Conditions:

This is a nearly level to gently undulating glaciolacustrine plain (Fig. 23) on which fine to moderately fine-textured glaciolacustrine sediments are overlain by discontinuous veneers of glaciofluvial and eolian materials. Accumulations of sedge and sphagnum peat occur locally and account for less than 15% of the total area. Small ponds occur where isolated deposits of ablation till were left by ice blocks separated from the main ice front.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL	SiCL/CL	2-6	3 4-5	0.GL, GL.GL, GLSZ.GL, Gleysols	Aspen/Low-bush cranberry/Dewberry Aspen/Balsam poplar/Bracted honeysuckle/Dewberry White spruce/Bracted honeysuckle/Dewberry
$\frac{GFv}{GL}$ or $\frac{Ev}{GL}$	$\frac{SL}{CL}$ or $\frac{Si}{CL}$	2-6	3-4	0.GL, GL.GL, GLSZ.GL	Aspen/Low-bush cranberry/Dewberry Aspen/Balsam poplar/Bracted honeysuckle/Dewberry
$\frac{Ovb}{GL}$	$\frac{Mesic}{CL}$	0-2	5-6	Mesisols	Black spruce/Labrador tea/Feathermoss Larch/Black Spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The presence of coarse, sandy overlays creates wide variation in soil moisture conditions. Elevated sandy sites support dry aspen stands, while a mixture of aspen forest, aspen-balsam poplar forest and white spruce stands is found on lower slopes where more moisture is available.

The small wetlands that have developed in groundwater discharge areas and where ponds have been infilled with peat support open black spruce and larch communities.

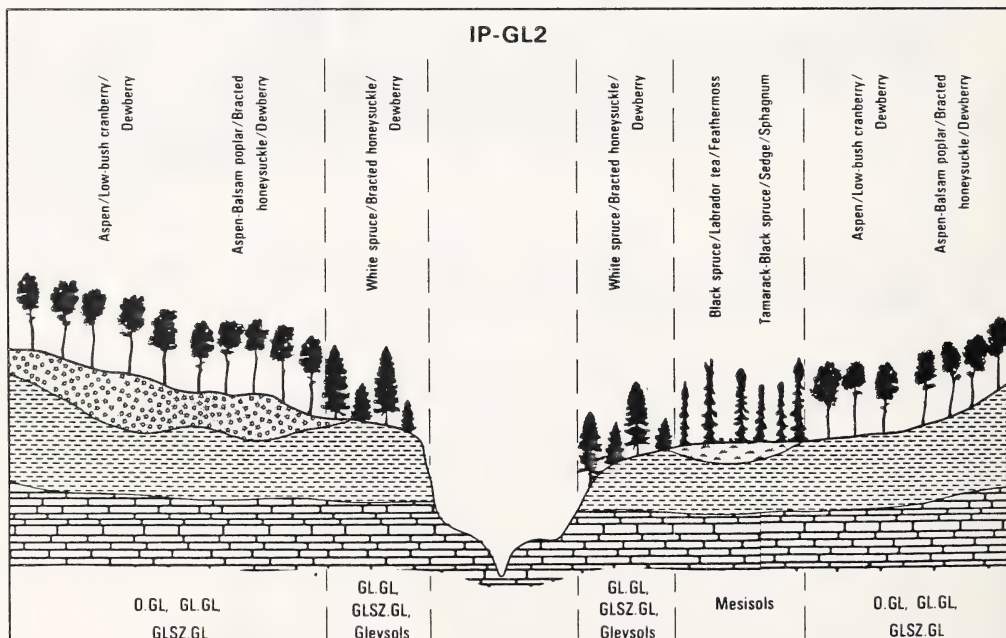


Figure 23: Schematic Diagram of Ecosection IP-GL2

Physical Conditions:

The predominant surficial materials found within this extensive undulating plain consist of moderately fine to fine-textured glaciolacustrine silts and clays (Fig. 24). These sediments are overlain by isolated deposits of glaciofluvial outwash and ice-rafted till deposits. Groundwater seepage is not as common here as elsewhere in the Isoegun Plain, perhaps because of long slopes.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL, GFv GL	Si CL	0-6	3	O.GL, SZ.GL	Aspen/Low-bush cranberry/Dewberry
			4	GL.GL, GLSZ.GL	Aspen/Balsam poplar/Bracted honeysuckle/Dewberry
			4-5	GLSZ.GL, Gleysols	White spruce/Bracted honeysuckle/Dewberry
Mv GL	SiCL CL	0-2	3	O.GL	Lodgepole pine/Low-bush cranberry/Wild sarsaparilla

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Gradual, topographically induced changes in soil drainage are reflected in the patterns of aspen forest on upper slopes and aspen-balsam poplar forest on lower slopes and depressions. Segregation of these two types is not as clearcut as in other ecosections, because seepage patterns are not as pronounced. A few mature white spruce stands occur within the deciduous forest, but most have been harvested for lumber.

A mixture of aspen and lodgepole pine forest is found on till outcrops that become more common toward the south.

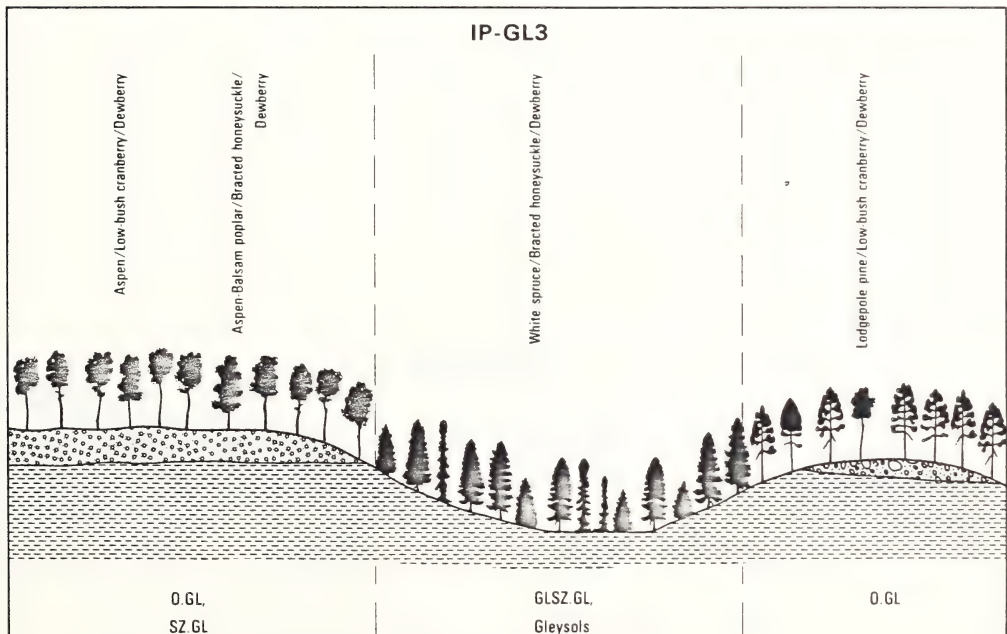


Figure 24: Schematic Diagram of Ecosection IP-GL3

Physical Conditions:

This gently inclined bedrock ridge (Fig. 25) occurs north of Big Mountain creek and is dissected by Campbell Creek. Surficial materials consist of glaciolacustrine sediments which overlie till deposits. Dark, partially decomposed shales of the Wapiti formation commonly occur within 50 cm of the soil surface and impede groundwater percolation. Groundwater seepage is thus pronounced, and gleyed soils are extremely common on lower slopes.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL	SiCL	2-9	2	O.GL, SZ.GL	Aspen/Low-bush cranberry/Dewberry
			3	O.GL, SZ.GL	Aspen/Low-bush cranberry/Dewberry
		0-2	4	GL.GL, GLSZ.GL	Aspen/Balsam poplar/Honeysuckle/ Dewberry
Ov GL	Mesic SiCL	0-2	5-6	Mesisols	Larch-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The basic vegetation pattern, with aspen forest on well drained upper slopes and aspen-balsam poplar on moister lower slopes, is similar to IP-GL3. The greater frequency of infilled ponds supporting shrubby and black spruce muskeg, and greater entrainment of seepage into well-defined tracks distinguish this ecosection.

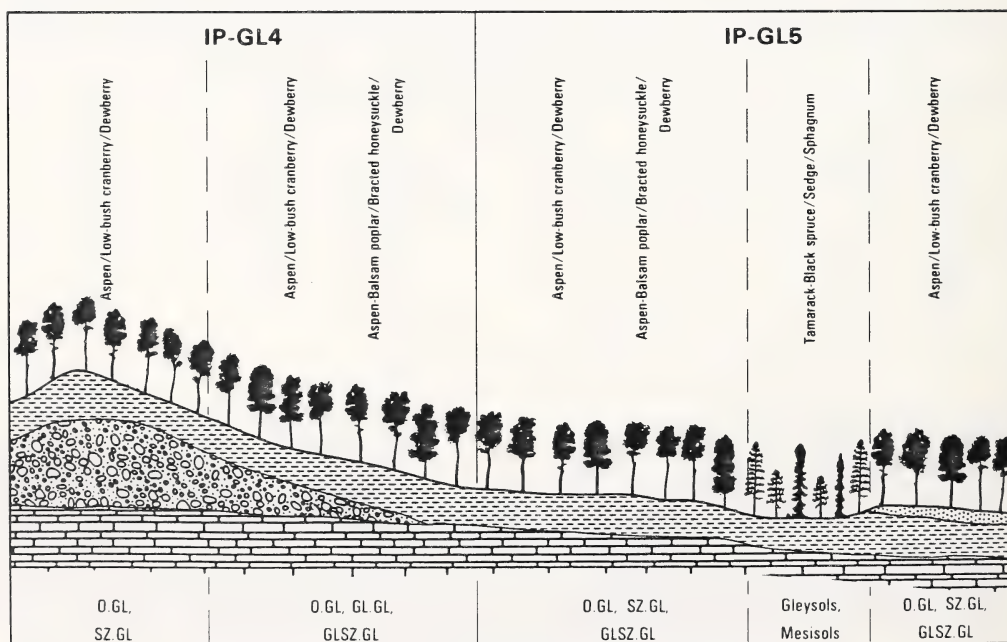


Figure 25: Schematic Diagram of Ecosections IP-GL4 and IP-GL5

IP-GL5

Physical Conditions:

This level to very gently undulating glaciolacustrine plain consists of well to imperfectly drained glaciolacustrine sediments, with small scattered accumulations of sedge and sphagnum peats (Fig. 25). Medium textured eolian veneers commonly overlie finer-textured glaciolacustrine sediments.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL, $\frac{Ev}{GL}$	CL, $\frac{Si}{CL}$	0-2	2	O.GL, SZ.GL	Aspen/Low-bush cranberry/Dewberry
GL	CL	0-2	3-4	O.GL, SZ.GL, GL.GL, GLSZ.GL	Aspen/Balsam poplar/Low-bush cranberry/Dewberry
$\frac{Ovb}{GL}$	$\frac{Mesic}{CL}$	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Labrador tea/Feathermoss Larch/Sedge/Sphagnum/Black spruce

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Most of the forest vegetation in this ecosection has been cleared for agricultural use. The remainder consists of aspen forest, with a rose understory reflecting the dryness of aeolian veneers, and mixed aspen-balsam poplar forest on moister low-lying sites.

Poorly drained organic soils are fairly common and support sedge and shrub vegetation ringed by black spruce.

Physical Conditions:

This is a part of an undulating delta complex in which glaciofluvial sands and silts overlies glacio-lacustrine sediments (Fig. 19). Glaciofluvial veneers become thicker and coarser-textured towards the north. Much of the landscape is imperfectly to poorly drained with organic soils having developed in depressional terrain.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
<u>GFv</u> <u>GL</u>	<u>S</u> <u>CL</u>	0-2	1-2	E.EB	Lodgepole pine/Feathermoss
			2-4	BR.GL, BR.GL, GLBR.GL	Aspen/Low-bush cranberry/Dewberry Aspen-balsam poplar/Bracted honey-suckle/Dewberry
<u>Ovb</u> <u>GL</u>	<u>Mesic</u> <u>CL</u>	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Labrador tea/Sphagnum
			6	Mesisols	Larch/Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The vegetation is an irregular mosaic of forested uplands and low-lying wetlands that reflects the pattern of surficial materials and drainage. The upland forest varies from lodgepole pine where sand deposits are thick to aspen where they are thinner and have more available moisture.

Organic deposits include large fens west of the Smoky River and peat-filled potholes throughout the ecoregion. Wetlands are most often dominated by sedges and shrubs, and fringed with black spruce forest.

Physical Conditions:

This level to very gently undulating glaciolacustrine plain consists of moderately fine to fine-textured glaciolacustrine sediments, which are overlain in some areas by thin medium to coarse-textured glaciofluvial veneers (Fig. 26). Extensive organic accumulations have developed in depressional terrain as a result of groundwater discharge from adjacent slopes (IP-GL4).

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GFV, GL GL	S1, CL CL	0-2	2-4	O.GL, SZ.GL, GL.GL, GLSZ.GL	Aspen/Low-bush cranberry/Dewberry Aspen-Balsam poplar/Bracted honeysuckle/Dewberry
GL	CL	0-2	4-5	GL.GL, GLSZ.GL, Gleysols	White spruce/Bracted honeysuckle/Dewberry Black spruce/Labrador tea/Feathermoss
Ovb GL	Mesic CL	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Labrador tea/Feathermoss
			6	Mesisols	Larch/Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

This landscape is distinguished from adjacent ecosections with similar materials (IP-GL4, IP-GL5) by a higher frequency of wetlands. Poorly drained organic soils cover about one-third of the ecosection and support a mixture of shrubby fen vegetation and black spruce forest. A mixture of aspen and aspen-balsam poplar forest occurs on better drained uplands.

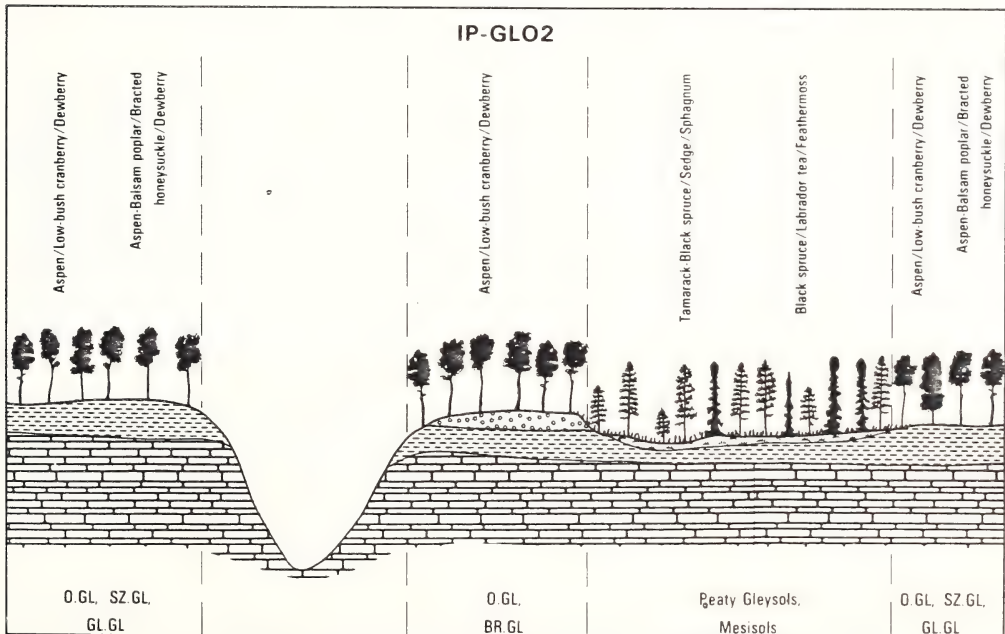


Figure 26: Schematic Diagram of Ecosection IP-GLO2

Physical Conditions:

These rounded ridges consist of gently undulating to rolling ground moraine which is often overlain by thin glaciofluvial and/or eolian deposits (Fig. 18). Seepage is pronounced along the interface between till and overlying coarser materials. The thinness of glaciofluvial materials indicates that these areas were covered only briefly by meltwaters before being exposed to wind and water erosion. Small organic deposits occur locally in depressional areas and adjacent to small kettle lakes.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
$\frac{Ev, GFv}{M}$	$\frac{Si-SiS}{SCL}$	2-9	2-3	O.GL, BR.GL	Aspen/Low-bush cranberry/Dewberry
$\frac{GFv, M}{M}$	$\frac{SL}{SCL}$	0-2	4-5	GL.GL, GLBR.GL, Gleysols	Aspen-Balsam poplar/Bracted honey-suckle/Dewberry

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The widespread occurrence of seepage generally offsets the ecological influence of coarse surficial materials. Aspen forest with a rose-dominated understory typical of dry conditions is only found on well drained hill crests, while a mixed aspen-balsam poplar forest dominates on the rest of the landscape. White spruce and paper birch are common components of the tree canopy along seepage tracks on cool northern exposures.

Physical Conditions:

This is a series of fens that have developed in subdued glacial meltwaters channels (Fig. 27). Accumulations of sedge and sphagnum peat are underlain by either fine-textured glaciolacustrine sediments or bedrock. Slow permeability of these materials and high groundwater tables make lakes and floating bogs common features of the landscape.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
Ob,0 GL	Mesic CL	0-2	6	Mesisols	Black spruce/Labrador tea/Feathermoss Larch/Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Sedge meadows and deciduous shrublands are the dominant vegetation types in the northern parts of this ecosection. Around Wilson Lake, open and closed black spruce forests cover about half the landscape.

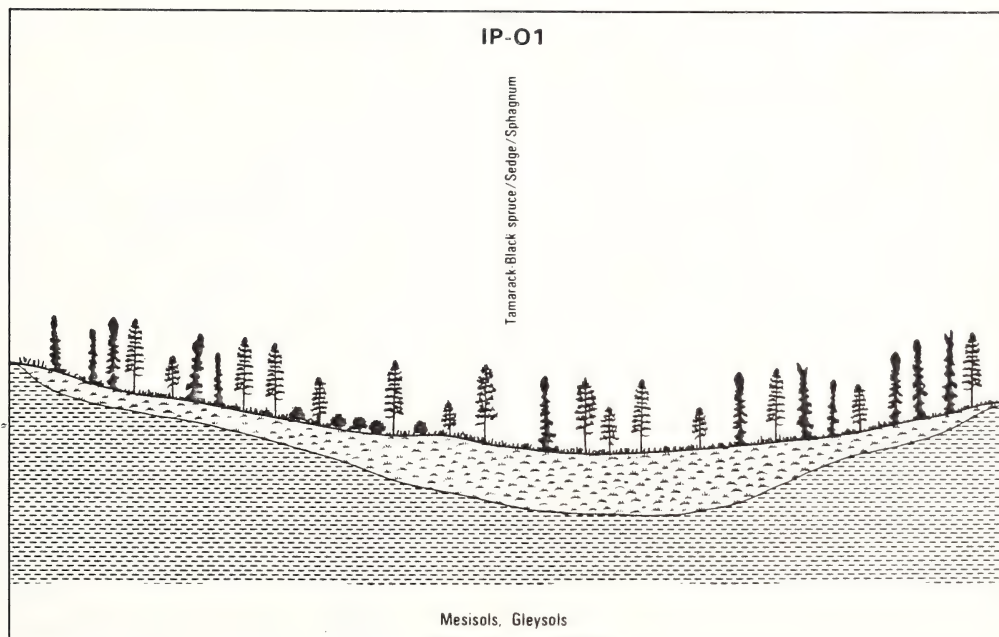


Figure 27: Schematic Diagram of Ecosection IP-01

2.1.4 Latornell Delta Subregion (Ecodistrict)

Within the Wapiti Plains region the Latornell Delta (Figure 28) is distinctive as a dissected deltaic plain. The subregion is underlain by bedrock of the Wapiti Formation in most locations. However, several isolated uplands are eroded remnants of the Paskapoo Formation which is found in the Simonette Benchlands subregion to the southwest. The underlying strata, which give the subregion a northwest trending slope, are masked by thick glacial deposits. The subregion falls into two ecoregions, the Boreal Mixedwood which is present below 860 m and the Boreal Foothills which is found on the isolated uplands.

The landscape within the subregion has been influenced by the erosional patterns of several major streams. The Kakwa, Smoky and Latornell Rivers along with their tributaries lie in deeply incised valleys which are still actively downcutting, and exposing the underlying bedrock to weathering processes.

The subregion is dominantly mantled by Continental till which is subsequently overlain by a complex of glaciolacustrine and glaciofluvial deposits of variable thickness. The varied drainage conditions associated with this complex of fine to coarse-textured materials results in a diverse vegetation pattern. Aspen forests tend to dominate, however, associations of balsam poplar, white spruce, black spruce and lodgepole pine are also found.

Eolian deposits, which in this case originate from glaciofluvial sediments, are common in the subregion. Variable drainage conditions are found in these areas depending on the depth of the sands. Vegetation reflects this complex drainage pattern with lodgepole pine occurring on the driest sites, mixtures of aspen, lodgepole pine and white spruce on intermediate sites and black spruce in the wetter locations.

Significant amounts of organic deposits are found within the subregion and these tend to support black spruce, tamarack and sedge vegetation. In addition, a complex pattern of vegetation can be found within the deeply incised river valleys. The colluvium and undifferentiated materials present along the valley walls make for a varied landscape in which a variety of vegetation associations have flourished.

The subregion has been divided into eleven ecosection/systems (Table 10) reflecting the complex nature of this former deltaic plain. Six fluvial systems have been identified (F4, F21, F23, F24, F37, F38) and are discussed in section 2.5 of Volume 1.

Table 10
ECOSECTIONS/SYSTEMS IN THE LATORNELL DELTA

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
LD-E1	Ridged dune plains	Eolian sand and peat	Black spruce, pine and aspen forest
LD-E01	Rolling eolian plains	Eolian and glaciofluvial sand and peat	Black spruce and lodgepole pine forest
LD-GF1	Undulating outwash plain	Glaciofluvial sand and peat	Aspen and black spruce-lodgepole pine forest, and treed and shrubby muskeg
LD-GF2	Subdued valley	Glaciofluvial sand and peat	Lodgepole pine-black spruce forest and treed muskeg
LD-GF3	Inclined terraces	Glaciofluvial sand	Lodgepole pine forest
LD-GL1	Undulating glaciolacustrine plain	Glaciolacustrine clay with sandy overlays	Aspen and balsam poplar poplar forest
LD-GL2	Gently undulating glaciolacustrine basin	Glaciolacustrine clay and peat	Lodgepole pine-black spruce forest
LD-GL3	Gently sloping terraces	Thin peat	Open black spruce forest
LD-M1	Undulating to inclined plateau	Till with sandy overlays	Lodgepole pine, white spruce and aspen forest
LD-M2	Subdued valleys with meltwater channels	Till with sandy overlays	Aspen, lodgepole pine and black spruce forest
LD-OGL1	Glacial meltwater channel	Peat and glaciolacustrine clay	Shrubby and treed muskeg, and aspen-balsam poplar forest

Physical Conditions:

This level to gently inclined eolian plain (Figure 29) occurs east of the Smoky River. It is characterized by distinct parabolic dunes and eolian sands of varying thickness which are underlain at depth by fine-textured glaciolacustrine sediments. Small organic accumulations occur locally.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
$\frac{E_{vb}}{GL}$	$\frac{S}{CL/C}$	0-2	3-5	BR.GL, GLBR.GL, Gleysols	Black spruce/Labrador tea/Feathermoss
E	S	2-9	1 2	E.EB E.EB	Lodgepole pine/Blueberry/Lichen Aspen/Rose/Pea vine
Ovb	Mesic	0-2	6	Mesisols	Tamarack-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The influence of coarse-textured surficial materials is modified considerably by underlying glacio-lacustrine clays that keep seepage water near the surface. Low-lying areas are poorly drained with black spruce forest found on organic soils and thin sand deposits. Sheet sand deposits on slopes fed by moving groundwater support aspen forest, while lodgepole pine forest is only found on the rapidly drained dunes.

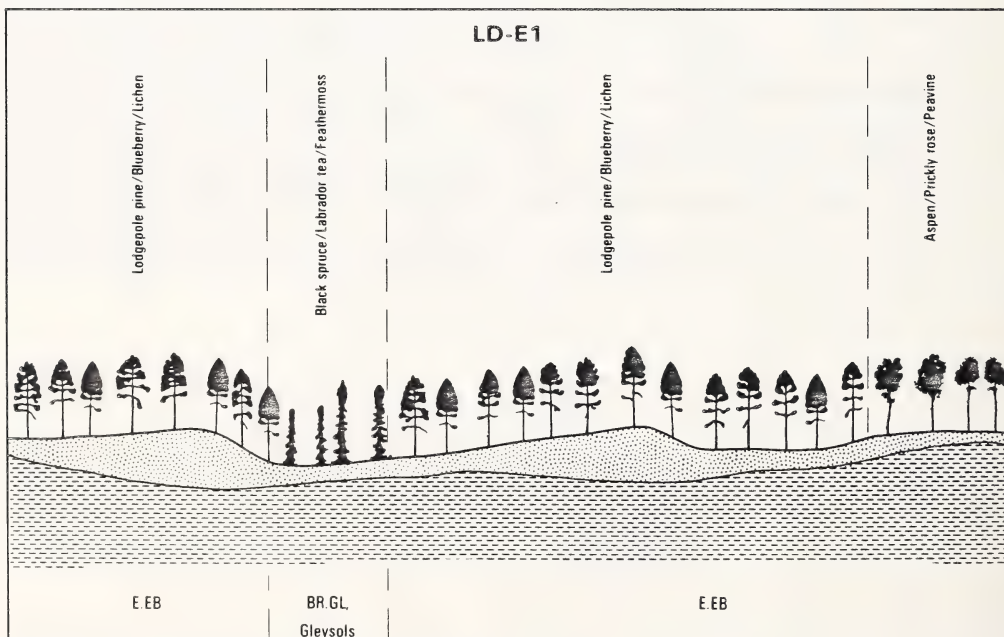


Figure 29: Schematic Diagram of Ecosection LD-E1

Physical Conditions:

This eolian complex (Figure 30) occurs in the vicinity of Karr Lake and consists of reworked outwash sand deposits with extensive organic accumulations occurring in depressional terrain. Longitudinal dunes, parabolic dunes, eskers and small kettle lakes are common features of the landscape. A complex of moderately fine-textured continental tills and glaciolacustrine deposits underlie this system. Small morainal outcrops occur in the western part of the ecosection.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
E, GF	S	2-15	1-2	E.EB	Lodgepole pine/Labrador tea/Lichen
Evb M/GL	S SCL	0-2	2-4	E.EB, BR.GL, GLE.EB	Lodgepole pine-Black spruce/Labrador tea/Feathermoss
			4-5	Gleysols	Black spruce/Feathermoss
0	Mesic	0-2	5-6	Mesisols, Peaty Gleysols	Tamarack-Black spruce/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Variation in the reworking of glaciofluvial sand deposits by wind combined with groundwater discharge has produced the vegetation pattern on this landscape. A field of large dunes between the Smoky and Latonnell Rivers has a classical pattern, with lodgepole pine forest on dry dune ridges and open black spruce forest on the organic soils between dunes. Elsewhere, reworking by wind has not been as extensive and soil moisture variation is not as pronounced. Subdued sand ridges and thin sheet deposits support lodgepole pine-black spruce and dense black spruce forest, with open wetland vegetation limited in extent.

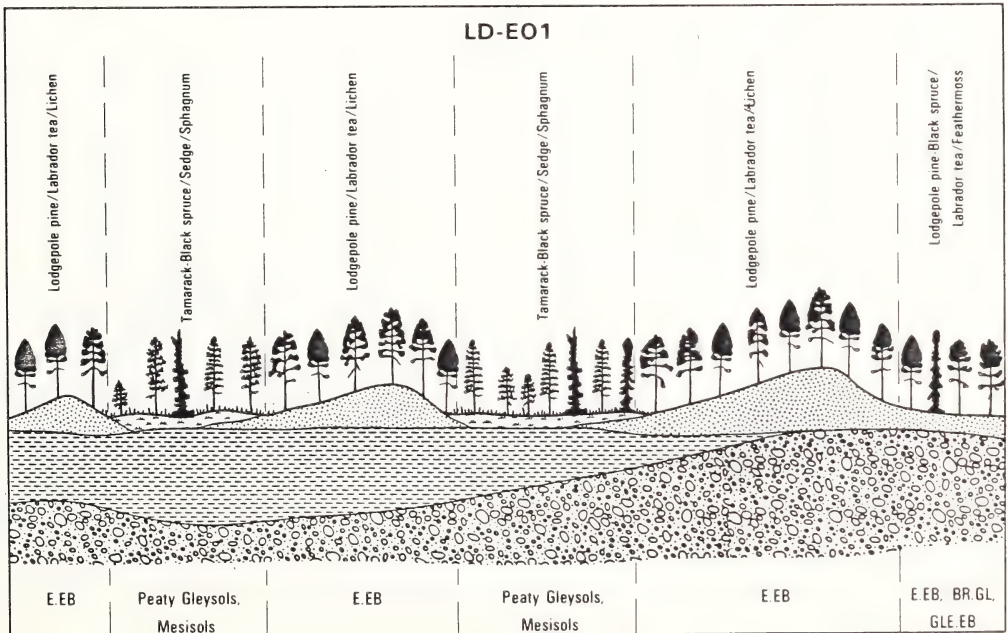


Figure 30: Schematic Diagram of Ecosection LD-E01

Physical Conditions:

This very gently undulating to moderately inclined outwash plain (Figure 31) is located immediately south of the confluence of the Kakwa and Smoky Rivers. Thick deltaic glaciofluvial sands are the principal surficial materials across the ecosection. These deltaic materials are underlain at depth by a combination of moderately fine-textured Continental till and fine-textured glaciolacustrine sediments. Locally, where glaciofluvial materials are thin or absent, organic accumulations have developed. Small, subdued dunes occur locally.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GF, E	S	2-15	1-3	E.EB, BR.GL	Aspen/Rose/Pea vine Lodgepole pine/Feathermoss
			3-4	BR.GL, GLBR.GL	Lodgepole pine-Black spruce/Labrador tea/Feathermoss
			5	Peaty Gleysols	Black spruce/Feathermoss
Ovb M/GL	Mesic CL	0-2	6	Mesisols	Tamarack-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

A topographically controlled moisture gradient determines the vegetation pattern on this landscape. Aspen and lodgepole pine forest is found on well-drained ridge tops, with lodgepole pine-black spruce forest on side slopes where more moisture is available. Black spruce forest occurs in poorly-drained groundwater discharge areas on lower slopes and valley bottoms. Level to depressional terrain where groundwater accumulates has a mixture of open black spruce forest and shrubby muskeg.

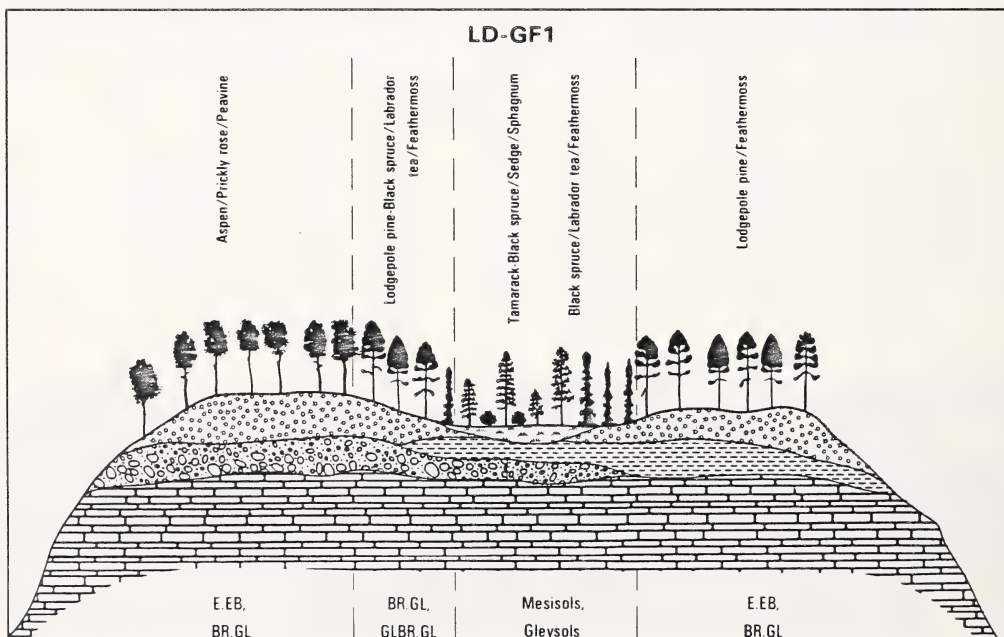


Figure 31: Schematic Diagram of Ecosection LD-GF1

Physical Conditions:

This system occupies the eroded tributary valleys east of the Latonnell River (Figure 32). Undulating to hummocky glaciofluvial sands are the principal surficial materials. These rapidly to poorly drained materials are underlain at depth by a complex of moderately fine to fine textured Continental tills and glaciolacustrine sediments. The presence of numerous dunes south of Moose River indicate that these deposits have been reworked by wind. Organic accumulations occur locally.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GFv GL/M	S CL	2-9	4-5	GLBR.GL, Peaty Gleysols	Black spruce/Feathermoss
GF, Gfb GL	S-SL CL	0-6	2-3	E.EB	Lodgepole pine-Black spruce/Labrador tea/Feathermoss Aspen/Rose/Pea vine
Ovb GL	Mesic CL	0-2	6	Mesisols	Tamarack-Black spruce/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Groundwater discharge from the adjacent Simonette Benchlands causes imperfectly to poorly drained conditions to predominate and lodgepole pine-black spruce and black spruce forest covers most of the landscape. Poorly drained organic soils between sand ridges support open black spruce muskeg. The thick, well-drained sand deposits near the Latonnell River are covered by aspen forest.

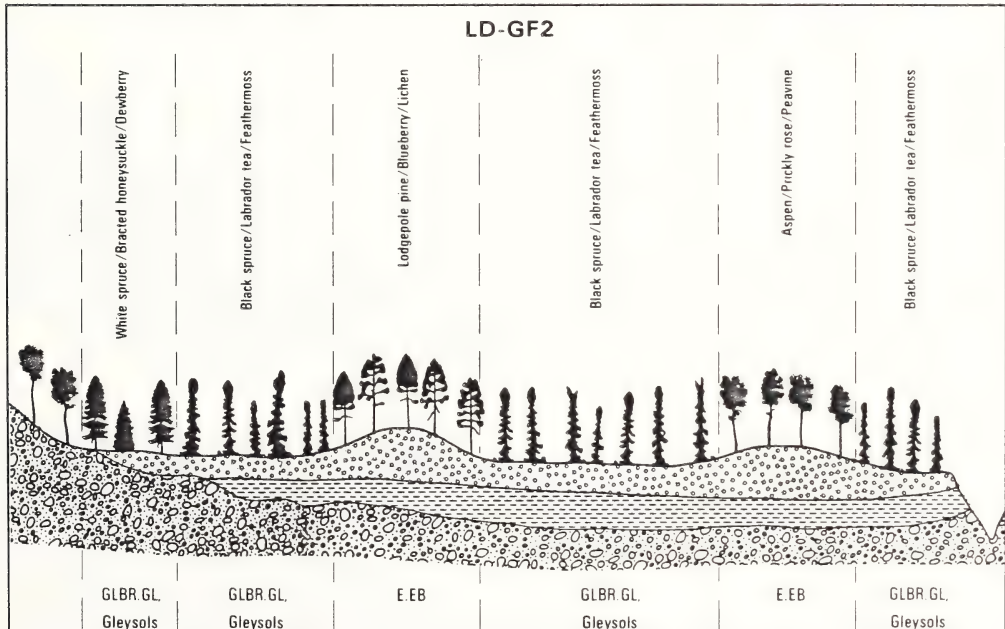


Figure 32: Schematic Diagram of Ecosection LD-GF2

Physical Conditions:

Located within the Smoky River valley, this system consists of a series of inclined glaciofluvial terraces that are some 60-70 m above the present floodplain (Figure 33). Approximately 10-25 cm of sand overlies coarse gravels. Organic accumulations of sphagnum peat are common at the bases of adjacent slopes (LD-GL3).

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GF	S	0-2	1-2	E.EB	Lodgepole pine/Labrador tea/Lichen

Ecoregion: Boreal Foothills

Ecological Conditions:

Coarse sand and gravel provides a dry, nutrient-poor environment on these terraces that support open lodgepole pine forest. A mixed shrubland of willow, dwarf birch and paper birch occurs at the base of slopes where groundwater is discharged.

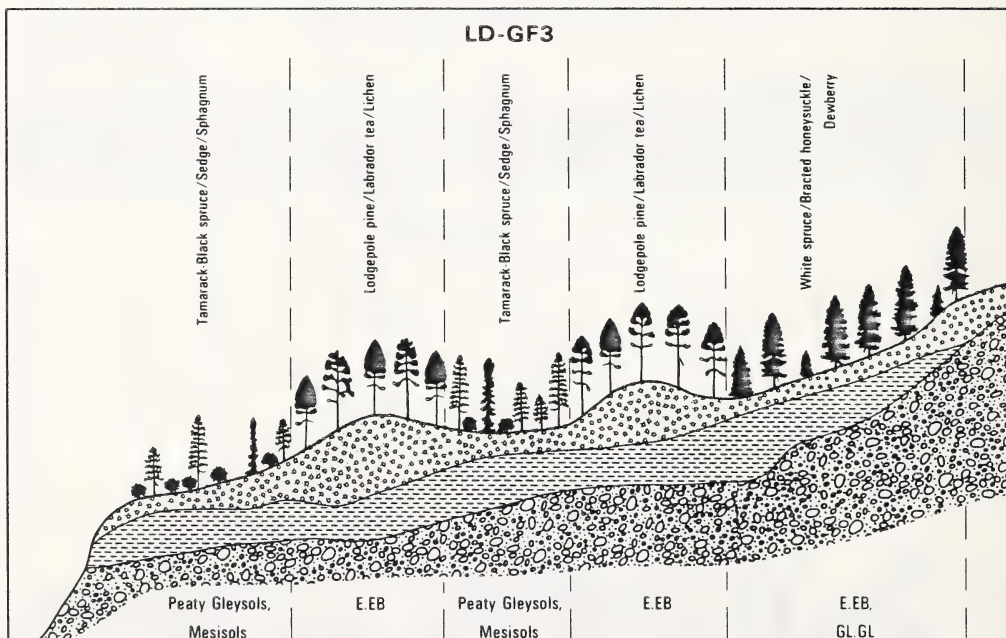


Figure 33: Schematic Diagram of Ecosection LD-GF3

Physical Conditions:

This level to gently undulating glaciolacustrine plain (Figure 34) borders the east side of the Smoky River and has been dissected by an unnamed (Zero Creek) tributary stream of the Smoky River. Numerous small glacial meltwater channel indicate that the Latonell Delta was expanding and glaciofluvial veneers were dispersed over much of the glaciolacustrine plain. These veneers become thicker closer to the Smoky River and the unnamed tributary system. Slightly stony Continental tills underlie the entire area.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
$\frac{GFv}{GL}$	$\frac{S-Si}{CL}$	2-6	2-3 3	BR.GL BR.GL	Aspen/Low-bush cranberry/Dewberry White spruce/Bracted honeysuckle/Dewberry
$\frac{GL, GLb}{M}$	CL	2-6	2-3 4	O.GL, BR.GL GL.GL	Aspen/Low-bush cranberry/Dewberry Aspen/Balsam poplar/Bracted honeysuckle/Dewberry
$\frac{Ov}{GL}$	$\frac{Mesic}{CL}$	0-2	5-6	Peaty Gleysols, Mesisols	Tamarack-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Coarse-textured overlays have little apparent influence on the vegetation pattern because of low permeability of underlying materials, although summer drought may retard successional rates. The upland forest is dominated by aspen on level sites and by aspen and balsam poplar on slopes where there is seepage. White spruce stands are limited in extent and confined to seepage tracks.

Poorly drained subdued meltwater channel support willow shrubland and closed black spruce forest.

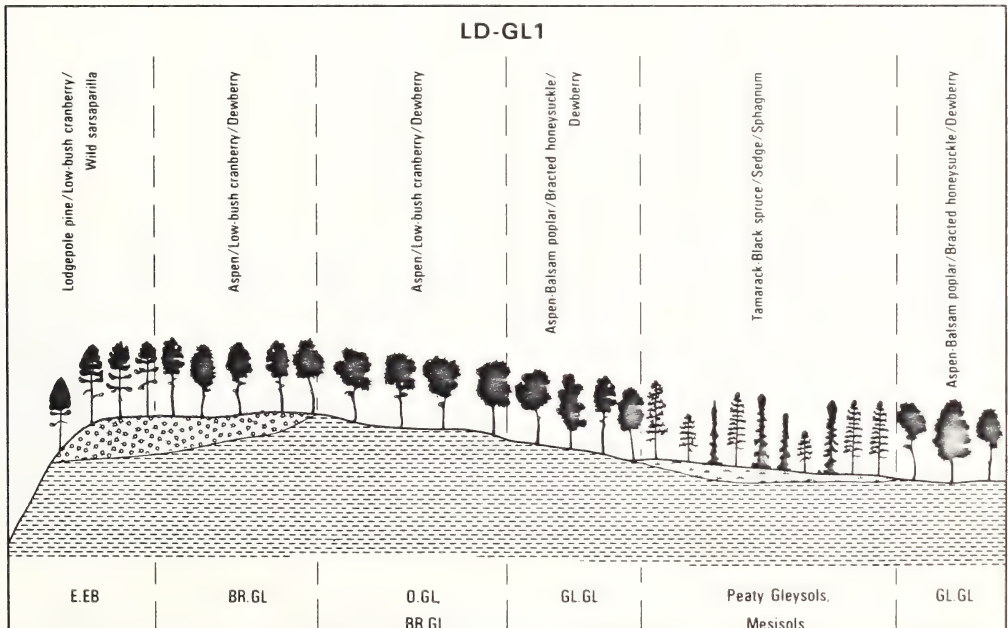


Figure 34: Schematic Diagram of Ecoregion LD-GL1

Physical Conditions

This poorly drained glaciolacustrine basin (Figure 35) occurs in the vicinity of Musreau Lake and extends eastward towards the Kakwa River. Slowly permeable glaciolacustrine sediments combined with groundwater discharge from the adjacent Cutbank Benchlands give rise to poorly drained conditions. Sediment thickness varies from thin veneers overlying till around the edges to thick, varved deposits surrounding Musreau Lake. Glaciofluvial veneers are common adjacent to surrounding systems (CB-M1, CB-M3).

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL	CL	0-5	4	GLSZ.GL, GL.GL	Lodgepole pine/Black spruce-Labrador tea Feathermoss
$\frac{Ov}{GL}$	$\frac{Mesic}{CL}$	0-2	5	Peaty Gleysols	Black spruce/Feathermoss
$\frac{Ob}{GL}$	$\frac{Mesic}{CL}$	0-2	6	Mesisols	Tamarack-Black spruce
$\frac{GFv}{GL}$	$\frac{Si}{CL}$	3-9	3	BR.GL	Lodgepole pine/Black spruce/Labrador tea/ Feathermoss

Ecoregion: Boreal Foothills

Ecological Conditions

Slopes, while gentle, permit sufficient groundwater movement so that forest rather than muskeg has developed on most of the landscape. The forest is dominated by black spruce and lodgepole pine, with local dominance shifting toward lodgepole pine on drier glaciofluvial overlays. Small areas of dwarf birch and sedge-dominated wetlands are found in the low-lying areas between glaciofluvial deposits.

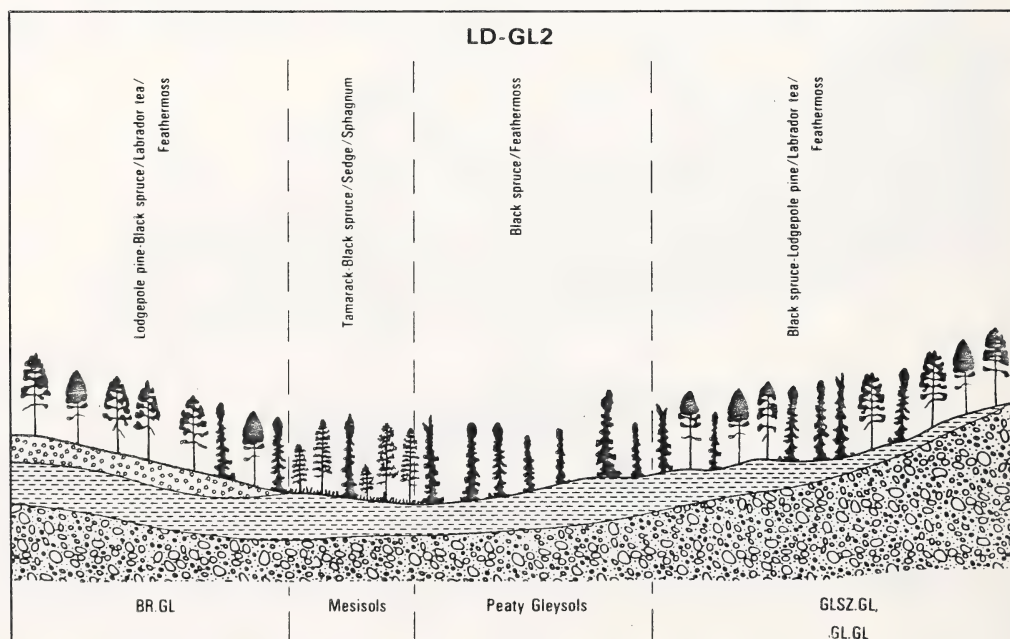


Figure 35: Schematic Diagram of Ecoregion LD-GL2

Physical Conditions

This is a dissected, gently sloping glaciolacustrine terrace on the east side of the Smoky River, 250-300 m above the floor of the present river valley (Figure 36). Thin glaciofluvial deposits commonly overlie glaciolacustrine sediments, but prevailing drainage conditions are imperfect to poor because of fine underlying materials and groundwater discharge from the adjacent Simonette Uplands. Some small dunes are found in the northern part of the area.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
$\frac{Ov}{GL/M}$	$\frac{Mesic}{SCL}$	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Labrador tea/Feathermoss
$\frac{GF, GFvb}{GL/M}$	$S, \frac{S}{SCL}$	0-15	2-3	E.EB	White spruce/Low-bush cranberry/Dewberry
$\frac{Evb}{GL}$	LS	0-15	2	E.EB	Lodgepole pine/Labrador tea/Lichen

Ecoregion: Boreal Foothills

Ecological Conditions

Underlying clays impede drainage and restrict rooting depth, so that most of the landscape is covered with an open bog forest of shallowly rooted black spruce. Sand deposits close to the river, which provide greater ease of rooting are fed by seepage water, support white spruce forest. Lodgepole pine forest occurs in dry dune environments.

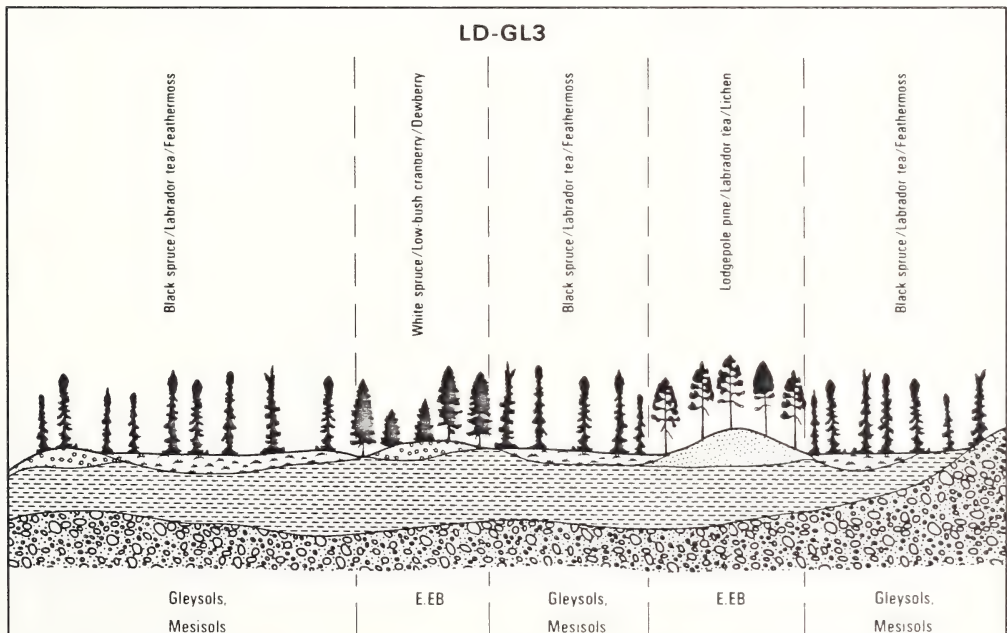


Figure 36: Schematic Diagram of Ecoregion LD-GL3

Physical Conditions

This series of very gently undulating to strongly inclined plateau remnants (Figure 37) are located between the Smoky and Latonell Rivers. These plateau remnants are covered by moderately fine-textured, slightly stony Continental tills. These till deposits are overlain on lower slope positions by thin fluvial veneers derived from slope wash and on upper slope positions by sandy eolian materials of variable thickness.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
Mv R	SCL/CL	2-30	2-3	BR.GL, O.GL	Aspen/Low-bush cranberry/Dewberry
			3-4	BR.GL, O.GL, GL.GL, GLBR.GL	Aspen/Thimbleberry/Wild sarsaparilla White spruce/Bracted honeysuckle/ Dewberry
Evb M	S SCL	2-5	2-3	PZ.GL, BR.GL, E.EB	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla White spruce/Low-bush cranberry/Dewberry

Ecoregion: Boreal Mixedwood
Boreal Foothills

Ecological Conditions

The occurrence of coarse-textured overlays with pronounced seepage along the interface between coarse and fine-textured materials creates a different pattern here than it does elsewhere in the subregion. Well-drained ridge tops support lodgepole pine forest, while a mixture of white spruce, aspen and pine forests with lush understory occurring on slopes. Mineral enrichment of moving groundwater may account for the apparently high productivity of these forest stands.

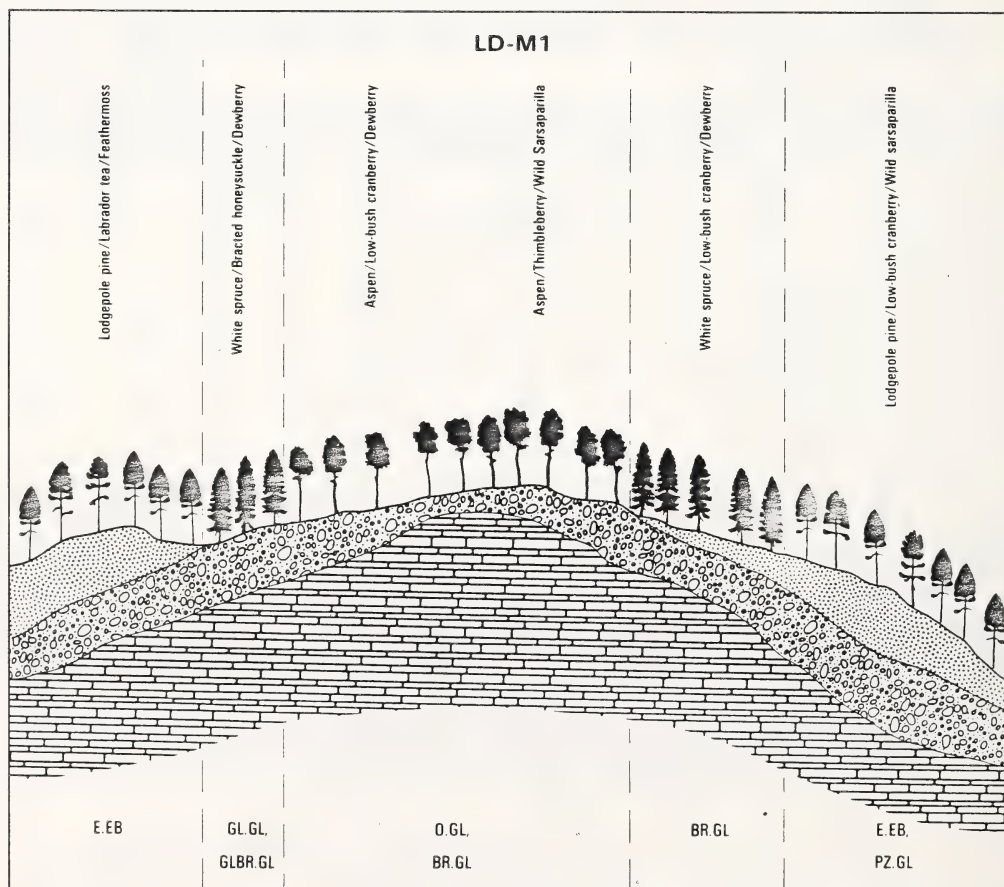


Figure 37: Schematic Diagram of Ecosection LD-M1

Physical Conditions:

This low-lying area (Figure 38) occurs between the Smoky and Latonell Rivers and is characterized by hummocky till deposits of Continental origin. These till deposits are medium to moderately fine-textured and are slightly stony in nature. In the extreme western portion of the system, thick outwash sands commonly overlie till deposits in a subdued glacial meltwater channel. Eolian materials of variable thickness commonly overlie till deposits to the north and south of this channel.

Materials	Texture	Slopes	Drainage	Soils	Plant Associations
M	SCL-CL	0-5	2-3	O.GL, BR.GL	Aspen/Low-bush cranberry/Dewberry
$\frac{GF+vb}{M}$	$\frac{S-Si}{SCL-CL}$	0-5	3-5	BR.GL, E.EB, GLBR.GL GLE.EB	Lodgepole pine-Low-bush cranberry- Wild sarsaparilla-White spruce-Low- bush cranberry-Dewberry
GF	S-Si	0-2	4-5	GLE.EB, Gleysols	Black spruce/Labrador tea/Feathermoss

Ecoregion: Boreal Mixedwood

Ecological Conditions

The complexity of the vegetation pattern is a reflection of the complex pattern of surficial materials. Hummocky moraine supports aspen forest, with black spruce stands in poorly drained depressions. Where till is overlain by glaciofluvial sand, an upland forest of lodgepole pine and white spruce has developed. Black spruce forest covers the poorly drained meltwater channel, with open pine forest on isolated eskers and dunes and shrubby muskeg around ponds.

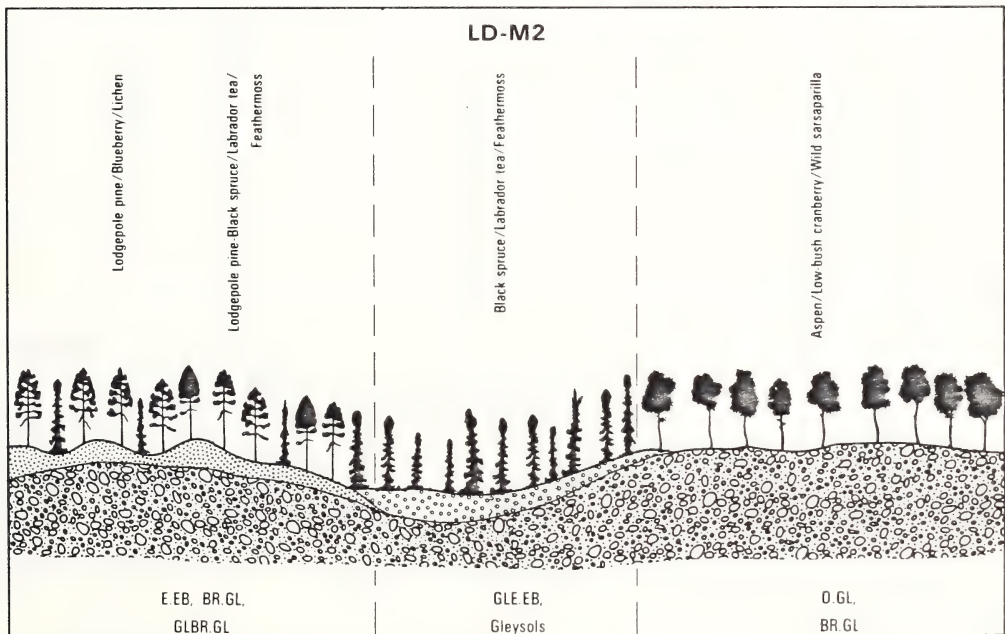


Figure 38: Schematic Diagram of Ecoregion LD-M2

Physical Conditions

This former glacial meltwater channel (Figure 39) is located between the Latonnell and Smoky Rivers. Accumulations of sedge and sphagnum peat dominate this gently undulating landscape. These organic materials are underlain by moderately fine-textured glaciolacustrine sediments, which are commonly exposed at the surface. In some areas, medium textured glaciofluvial outwash materials overlie these slowly permeable glaciolacustrine materials. Several subdued eskers occur immediately adjacent to the Latonnell and Smoky Rivers.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
Ovb GL	Mesic CL	0-2	5-6	Peaty Gleysols, Mesisols	Tamarack-Black spruce/Sedge/Sphagnum Black spruce/Labrador tea/Feathermoss
GL	CL	0-2	3-4	O.GL, GL.GL	Aspen/Balsam poplar/Bracted honeysuckle/ Dewberry

Ecoregion: Boreal Mixedwood

Ecological Conditions

Black spruce forest predominates on this poorly drained landscape, with sedge-dominated wetlands bordering ponds and streams. Aspen-balsam poplar forest occurs on slightly elevated glaciolacustrine outcrops, while scattered small eskers support lodgepole pine forest.

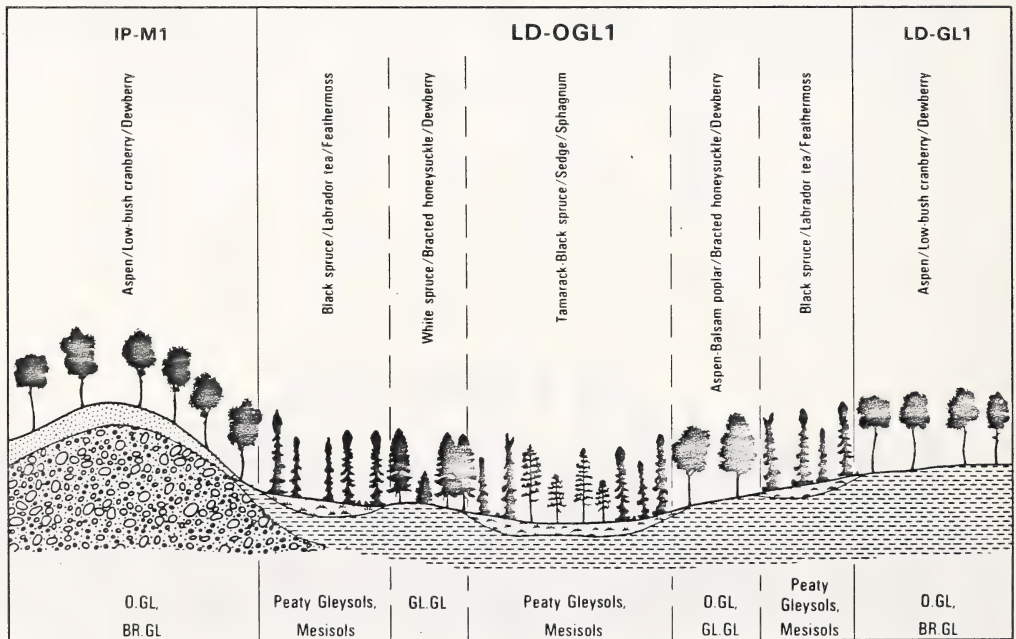


Figure 39: Schematic Diagram of Ecoregion LD-0GL1

2.1.5 Pinto Plain Subregion (Ecodistrict)

The Pinto Plain stretches across the north-northwestern portion of the study area (Figure 40) and consists of a subdued to rolling bedrock controlled plain. The underlying rock strata is of the Wapiti Formation and is exposed at several locations within the Wapiti River and Nose Creek valleys. The rolling terrain gives a varied relief with elevations ranging from 620 m to 1 000 m. Within this subregion the vegetation is influenced by factors found in both the Boreal Mixedwood and Boreal Foothills ecoregions.

Glacial activity left a very heterogeneous landscape which has been subsequently eroded by wind and water. Glaciolacustrine sediments and till deposits generally dominate with complexes of glaciofluvial, eolian, organic and fluvial materials very common. These surficial materials have masked the influence of regional climate resulting in a complex mosaic of overstory types which are largely controlled by edaphic factors.

The western part of the subregion is dominated by ablation till of Continental origin which is often overlain by glaciolacustrine and glaciofluvial materials. Lodgepole pine is dominant over much of this area above 860 m. Below this elevation aspen forests are much more common. Black spruce, tamarack and white spruce are also present over much of this area.

In those areas of the subregion where fluted till is the dominant surficial material a complex of vegetation occurs. Aspen forest is

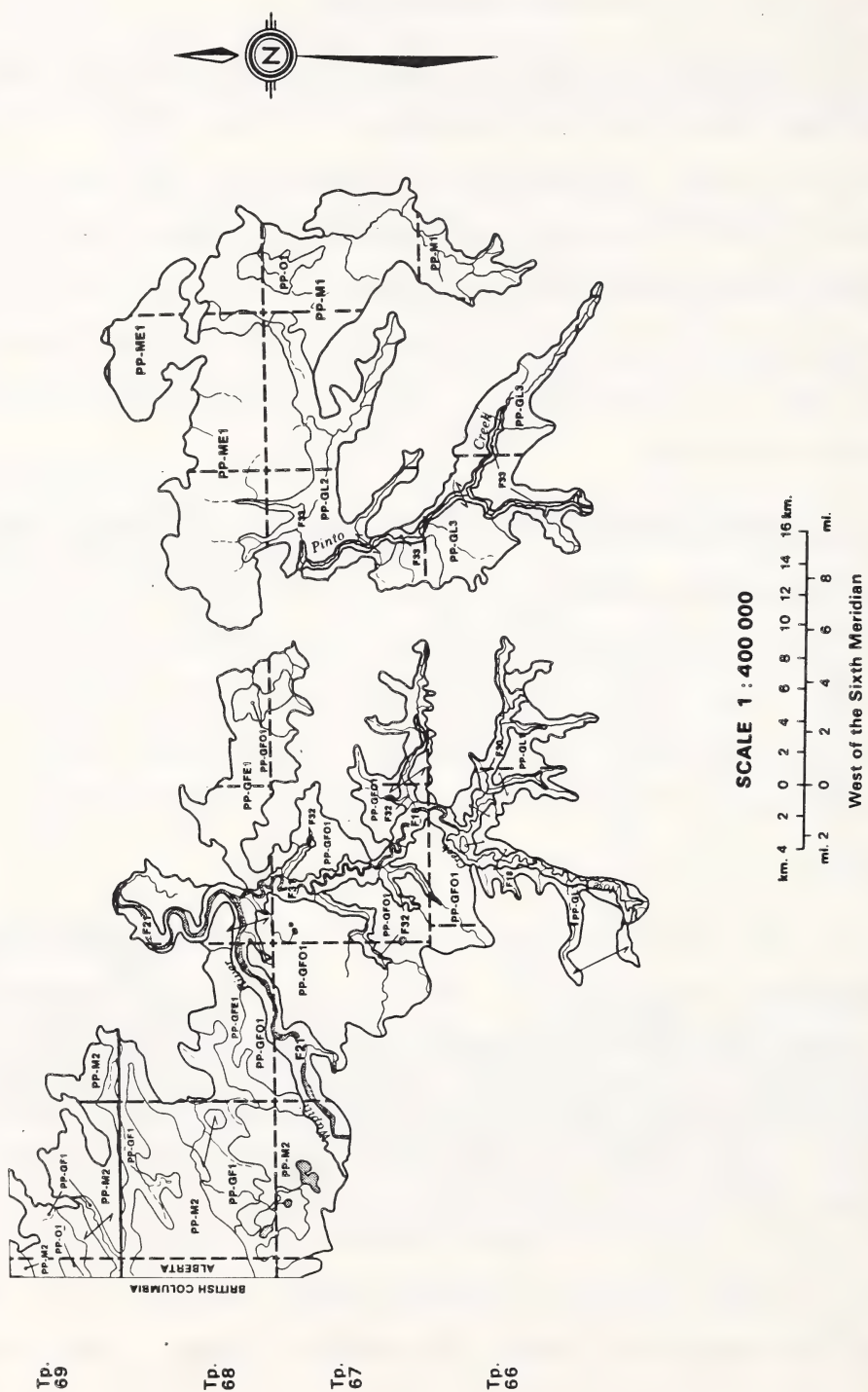


Figure 40: Pinto Plain Subregion (PP)

is common with understories reflecting variable drainage conditions. Lodgepole pine, black spruce, tamarack and white spruce vegetation all occur in association with the aspen forest.

A complex of glaciolacustrine, eolian and organic deposits occurs locally throughout the subregion and also supports varied vegetation types. The glaciolacustrine materials are generally poorly drained, hence they support wetland vegetation consisting of black spruce and tamarack. The eolian materials tend to support a complex of lodgepole pine, aspen and wetland vegetation dependent on drainage conditions.

The subregion has been divided into ten ecosection/systems. Landform, parent material and vegetation of each are displayed in Table 11. More detailed descriptions with accompanying schematic diagrams follow the table.

The Pinto Plain was identified as having six fluvial systems (F18, F21, F30, F32, F32, F33). These are discussed in Section 2.5 of Volume I.

Table 11
ECOSECTIONS/SYSTEMS OF THE PINTO PLAIN

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
PP-GF1	Glacial meltwater channel	Glaciofluvial sand and peat	Lodgepole pine, white spruce and black spruce forest
PP-GFE1	Rolling outwash plain	Glaciofluvial sand and eolian silt	Aspen and lodgepole pine forest
PP-GF01	Gently rolling outwash plain	Glaciofluvial sand and gravel, peat	Lodgepole pine and open black spruce forest, sedge meadows
PP-GL1	Undulating glacio-lacustrine terraces	Glaciolacustrine clay and peat	Lodgepole pine, aspen and white spruce forest
PP-GL2	Gently sloping basin	Peat and glaciolacustrine clay with silty overlays	Shrubby and treed muskeg, lodgepole pine and black spruce forest
PP-GL3	Gently rolling basin	Glaciolacustrine clay with overlays of silt and peat	Aspen, balsam poplar and black spruce forest, shrubby muskeg
PP-M1	Fluted till plain	Fine-textured till	Aspen, balsam poplar and white spruce forest
PP-M2	Subdued bedrock ridges	Fine-textured pitted till	Lodgepole pine, aspen and white spruce forest
PP-ME1	Rolling bedrock ridge	Fine-textured till with silty overlay	Aspen and balsam poplar forest
PP-O1	Depressional bogs and fens	Peat	Open black spruce forest, deciduous shrubland

Physical Conditions

This subdued glacial meltwater channel (Figure 41) is occupied by parts of Diamond Dick, Sylvester and Calahoo Creeks. Medium to coarse-textured glaciofluvial materials are underlain at depth by finer-textured glaciolacustrine sediments below 820 m and by moderately fine-textured Continental tills above 820 m. Impedance of drainage and excessive seepage causes imperfectly to poorly-drained conditions to dominate. Rapidly drained eskers and poorly drained backwater terraces are common especially throughout the Calahoo Creek valley.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GFvb GL/M	SL CL/StCL	2-5	3-4	BR.GL, GLBR.GL	Lodgepole pine-Black spruce/Labrador tea/ Feathermoss
			4-5	GLBR.GL, Gleysols	White spruce/Low-bush cranberry/Dewberry, Black spruce/Feathermoss
GF	SL/SiL	2-15	1-2	BR.GL, E.EB	Lodgepole pine/Feathermoss
Ovb GL	Mesic CL	0-2	5-6	Mesisols, Gleysols	Larch-Black spruce/Sedge/Sphagnum, Black spruce/Labrador tea/Feathermoss

Ecoregion: Boreal Foothills
Boreal Mixedwood

Ecological Conditions:

Variation in the depth of glaciofluvial deposits creates a moisture gradient that controls the vegetation patterns. The driest environments on eskers and other thick deposits support lodgepole pine forest. Thinner deposits cover most of the landscape and support lodgepole pine- black spruce and black spruce forests, with white spruce forest found at the base of slopes where there is moving groundwater. Open shrubby wetland vegetation occurs on poorly drained depressional terrain.

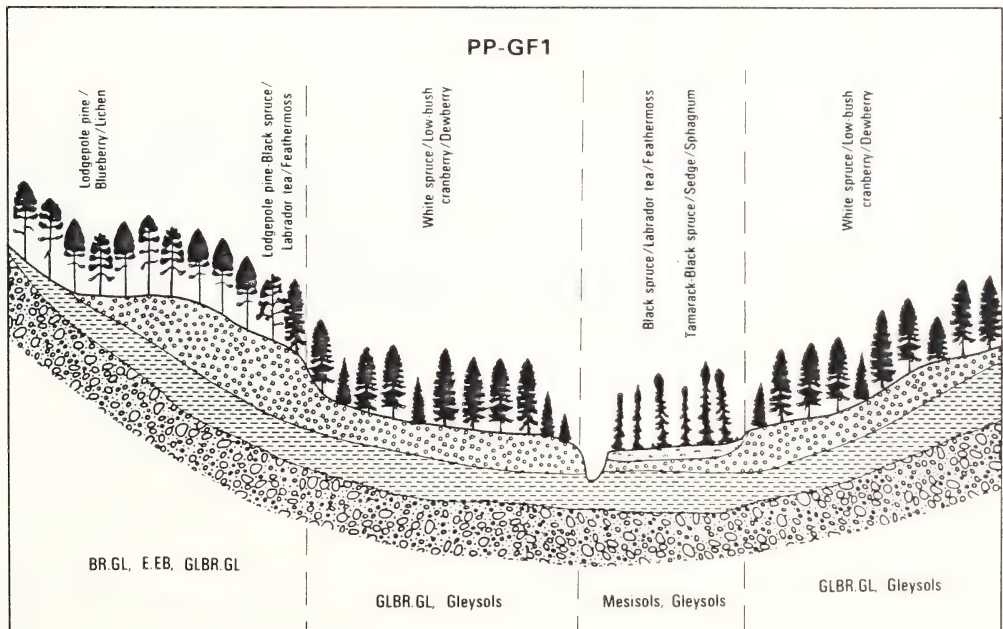


Figure 41: Schematic Diagram of Ecoregion PP-GF1

Physical Conditions

This is a gently rolling glaciofluvial outwash plain on which coarse glaciofluvial sands are overlain by fine-textured aeolian sheets of variable thickness (Figure 42). Longitudinal dunes are found east of Nose Creek. Portions of this ecosection are underlain by either glaciolacustrine sediments or Continental till. These fine textured materials are deep enough that they have minor influence on soil drainage, thus well to rapidly drained conditions predominate.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
Evb GF	SiL S/SCL	2-6	2 2-3	BR.GL	Aspen/Rose/Pea vine Aspen/Low-bush cranberry/Dewberry
GF	S/SCL	0-2	1-2	E.EB	Lodgepole pine/Blueberry/Lichen
E	SiL/S	2-9	1-2	E.EB	Aspen/Rose/Pea vine Lodgepole pine/Blueberry/Lichen

Ecoregion: Boreal Mixedwood

Ecological Conditions

Silty aeolian deposits ameliorate the dryness of coarse-glaciofluvial sand and allow aspen forest to dominate over most of the landscape. Lodgepole pine forest is only found on thick glaciofluvial outcrops and large dunes, where drainage is rapid.

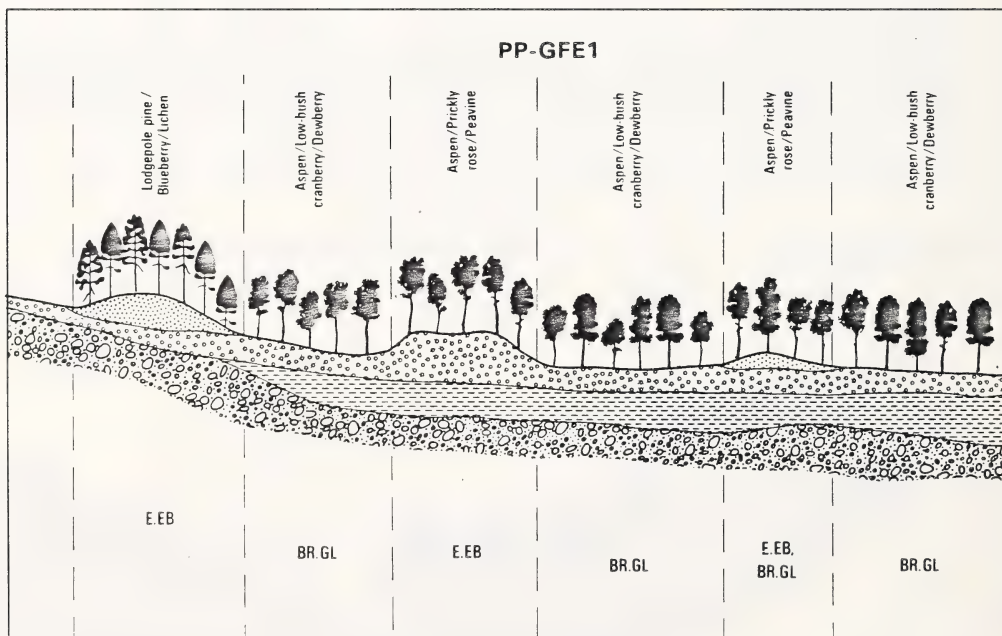


Figure 42: Schematic Diagram of Ecosection PP-GFE1

Physical Conditions

This level to gently rolling glaciofluvial outwash plain occurs near the confluence of Nose Creek and the Wapiti River (Figure 43). Coarse-textured glaciofluvial sands and gravels are the principal surficial materials across much of this landscape. Adjacent to Nose Creek, glaciofluvial deposits tend to be finer-textured and this may be a result of numerous bank overflow episodes.

Accumulations of sedge and sphagnum peat occur locally and account for approximately 35-40% of the area. Organic accumulations are underlain by fine-textured glaciolacustrine backwater sediments in depressional areas adjacent to NB-MC1 and in glacial meltwater channels. Minor occurrences of eolian veneers occur east of Nose Creek.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GF	gS/SCL	0-9	1-3	E.EB, E.DYB, BR.GL	Lodgepole pine/Feathermoss
Ovb GL	Mesic SCL/CL	0-2	5-6	Peaty Gley- sols, Mesi-	Black spruce/Labrador tea/Feathermoss Larch/Black spruce/Sedge/Sphagnum

Ecological Conditions:

Coniferous forest dominates on this landscape because of the extremes of moisture availability produced by deposition of glaciofluvial sands. Well drained uplands support lodgepole pine forest, while open black spruce forest and sedge meadows are found on poorly drained lowlands.

Finer-textured materials in adjacent ecosections with similar topography support mixed deciduous-coniferous forest.

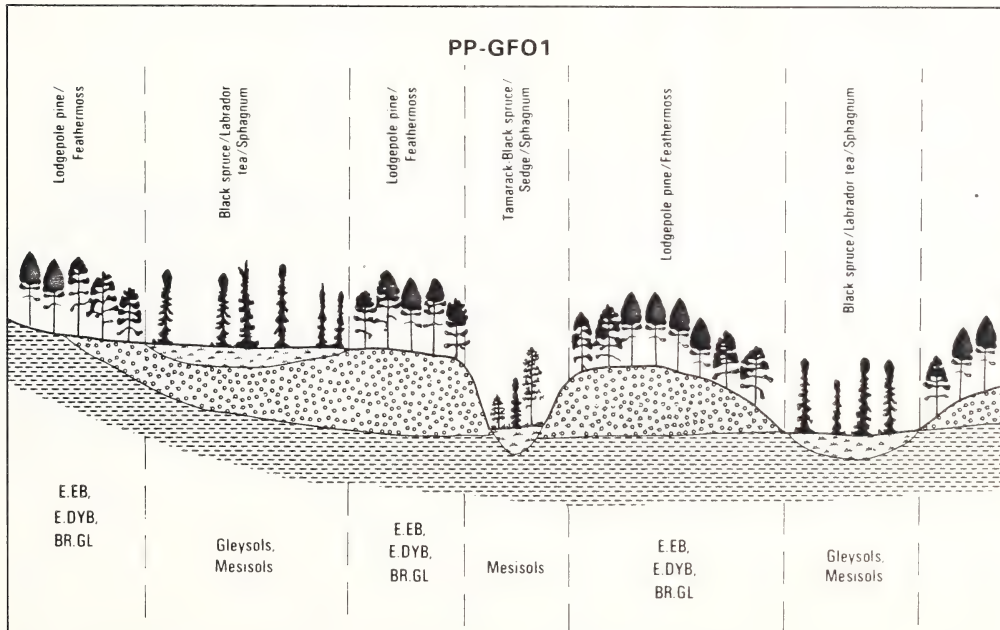


Figure 43: Schematic Diagram of Ecosection PP-GF01

Physical Conditions

These level to gently undulating glaciolacustrine terraces (Figure 44) border the middle and lower reaches of Muddy, Little Muddy and Sandbar Creeks, as well as the middle reaches of Nose Creek. They are possibly the result of ice damming within the Nose Creek valley which created a short-lived glacial lake. Thin glaciofluvial veneers as well as fluvial veneers occur locally.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL, GFv GL	Sic/CL	0-6	2-4	O.GL, BR.GL, GL.GL, GLBR.GL	Lodgepole pine/Low-bush cranberry/Wild sarsaparilla Aspen/Low-bush cranberry/Wild sarsaparilla
Ov GL	Mesic CL	0-2	5-6	Peaty Gley- sols, Mesic sols	White spruce/Common horsetail

Ecoregion: Boreal Foothills

Ecological Conditions

Seepage on slopes and coarse-textured materials adjacent to creek valleys separate the vegetation into two components. Deciduous aspen and aspen-balsam poplar forest is found on slopes, with white spruce stands in the lower portion of seepage tracks. Glaciofluvial deposits adjacent to creeks are coarse-textured enough that drought is significant; lodgepole pine forest is found on these deposits.

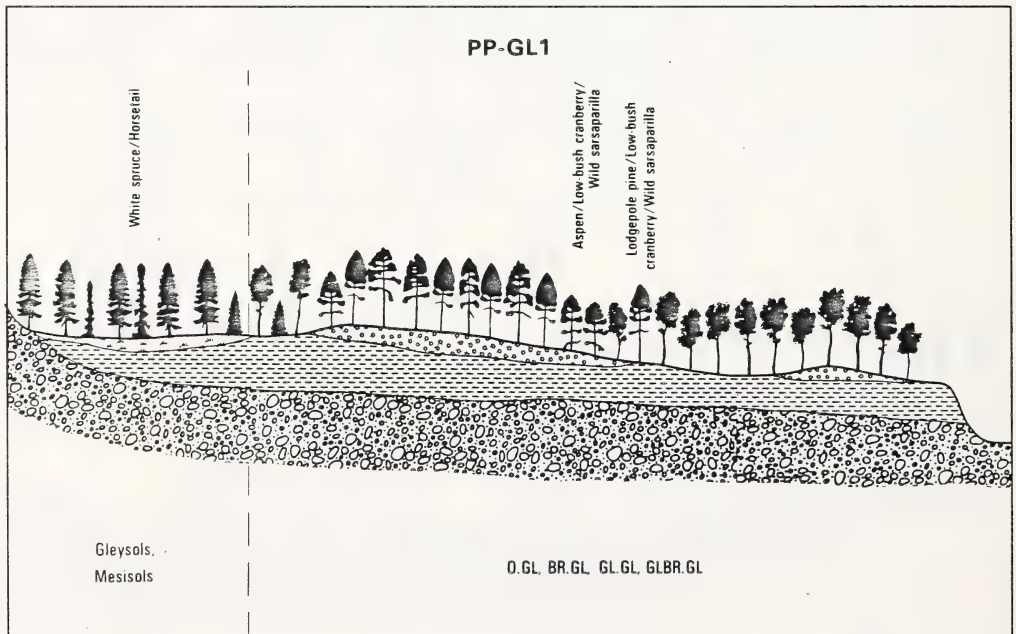


Figure 44: Schematic Diagram of Ecoregion PP-GL1

Physical Conditions

This landscape is a level to very gently sloping glaciolacustrine basin (Figure 45) drained by Stoney Creek and an unnamed tributary of Pinto Creek. Glaciolacustrine sediments of former Glacial Lake Peace are the principal deposits and tend to be imperfectly to poorly drained.

Extensive deposits of sedge and sphagnum peats have developed on level terrain. On upper slopes within the basin coarse-textured glaciofluvial and/or eolian veneers commonly overlie glaciolacustrine sediments.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
<u>Ovb</u> GL	<u>Mesic</u> CL	0-2	6	Mesisols	Larch-Black spruce/Sedge/Sphagnum
<u>GFv/Ev</u> GL	<u>Sil</u> CL	0-2	1-3	O.GL, GL.GL	Lodgepole pine/Blueberry/Lichen Black spruce-Lodgepole pine/Feathermoss
GL			4-5	Gleysols, Mesisols	Black spruce/Labrador tea/Feathermoss Larch-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions

Muskeg dominated by dwarf birch and black spruce covers most of these poorly drained valleys. The slight elevation of glaciofluvial deposits in the upper part of these valleys creates dry conditions that support lodgepole pine forest.

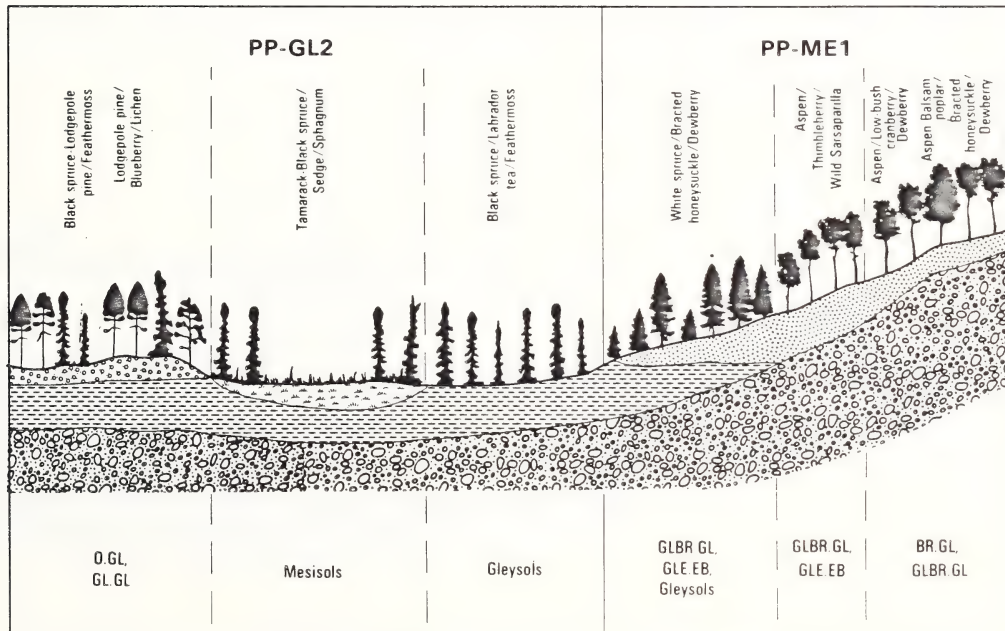


Figure 45: Schematic Diagram of Ecosections PP-GL2 and PP-ME1

Physical Conditions

This undulating to gently rolling glaciolacustrine basin (Figure 46) is now occupied by the upper reaches of Pinto Creek and consists chiefly of reworked, fine-textured glaciolacustrine sediments with a moderate stone content. Imperfectly drained conditions predominate due to pronounced groundwater discharge from the adjacent Cutbank Benchlands (CB-M1) combined with the slowly permeable glaciolacustrine materials. Thin glaciofluvial veneers and several small eskers occur in the upper portion of this system. Organic accumulations of sphagnum peat occur sporadically at the base of slopes. The entire ecosection is underlain by moderately fine-textured Continental tills.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL, GLvb M	CL StCL	0-2	3-4	O.GL, SZ.GL, GL.GL, GLSZ.GL	Aspen-balsam poplar/Bracted honeysuckle/ Dewberry Aspen/Lowbush cranberry/Dewberry
GFv GL	StL CL	2-5	2	E.EB, BR.GL	Lodgepole pine-Feathermoss
Ovb GL	Mesic CL	0-2	5-6	Peaty Gley- sols, Mesic sols	Black spruce/Labrador tea/Feathermoss Larch-Black spruce/Sedge/Sphagnum

Ecoregion: Boreal Mixedwood

Ecological Conditions

Soil conditions are somewhat drier on the floor of this basin compared to PP-GL2. Aspen and aspen-balsam poplar forest covers about half of the landscape. Black spruce forest and shrubby muskeg occur at the base of slopes where groundwater stagnates, and lodgepole pine forest is found on silty glaciofluvial deposits near the headwaters of Pinto Creek.

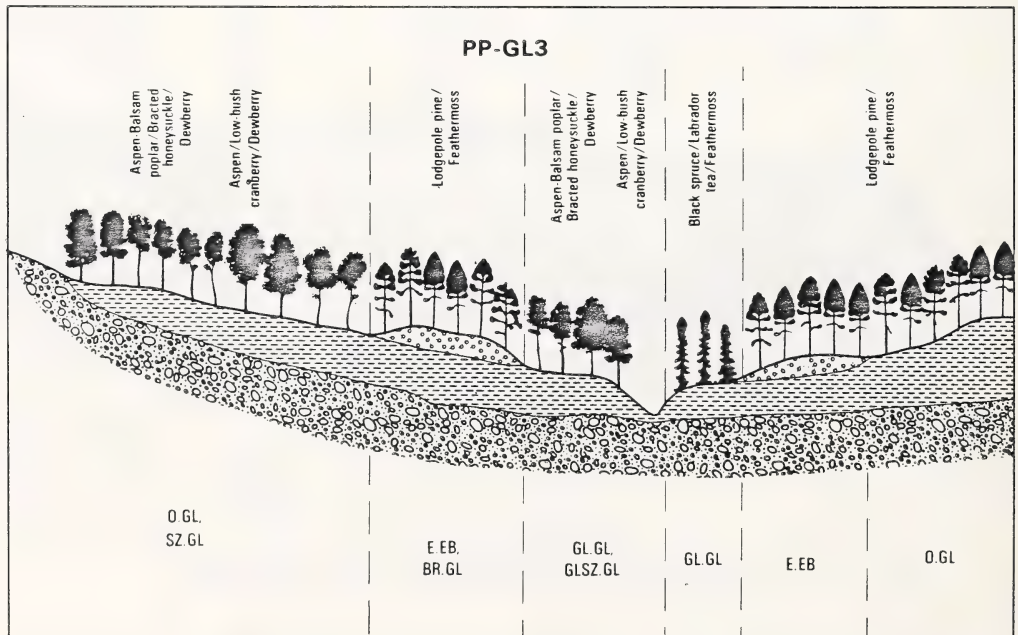


Figure 46: Schematic Diagram of Ecosection PP-GL3

Physical Conditions:

This rolling to ridged till plain borders Bald Mountain Creek and is characterized by numerous flutings and small till covered ridges which are oriented in a southeast-northwest direction (Figure 47). Local glaciolacustrine sediments which occur between the fluting features suggest that water backed up into these areas creating numerous small islands.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
M	S1CL/CL	2-30	2-4	O.GL, GL.GL	Aspen/Low-bush cranberry/Dewberry Aspen-Balsam poplar/Bracted honeysuckle/ Dewberry White spruce/Bracted honeysuckle/Dewberry
$\frac{GLv}{M}$	$\frac{CL}{S1CL}$	2-5	4-5	GLSZ.GL, GL.GL,	Aspen/Balsam poplar/Bracted honeysuckle/ Dewberry White spruce/Bracted honeysuckle/Dewberry Black spruce/Feathermoss

Ecoregion: Boreal Mixedwood

Ecological Conditions

Aspen forest covers most of the landscape with stands of aspen-balsam poplar and white spruce found on the lower side slopes of the larger ridges. Small patches of black spruce forest and willow shrubland occur in poorly drained areas between ridges and along stream courses.

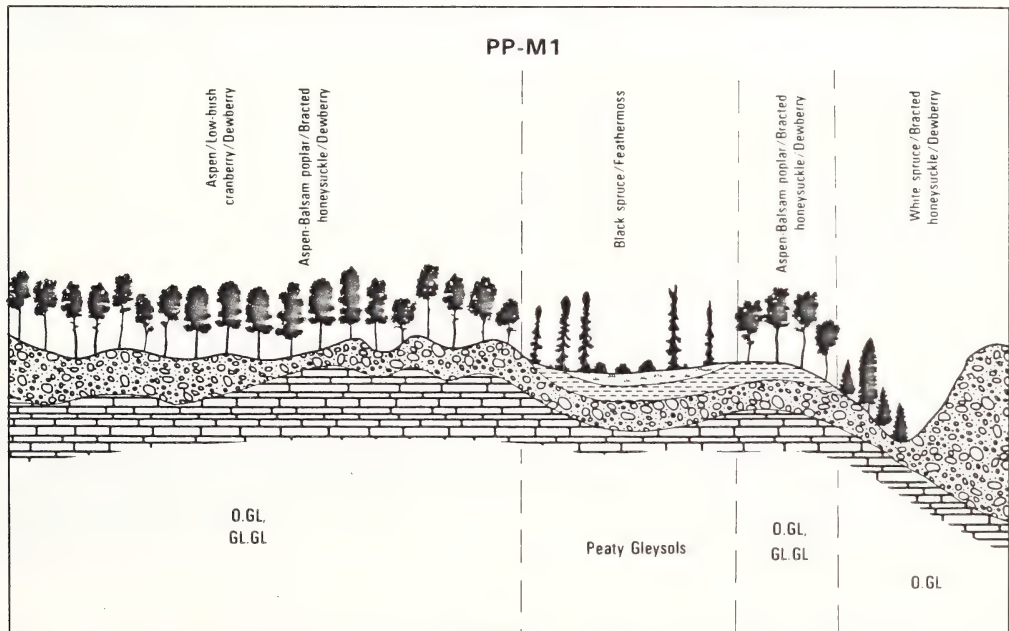


Figure 47: Schematic Diagram of Ecoregion PP-M1

Physical Conditions

This system is a series of subdued northeast-southwest trending bedrock ridges covered with moderately fine-textured pitted moraine (Figure 48). These ridges, which occur in the northernmost part of the Pinto Plain, are separated by Diamond Dick, Calahoo and Sylvester Creeks. Imperfectly drained conditions are associated with depressional terrain in the uplands and glaciofluvial veneers on lower side slope positions. Glaciofluvial veneers are common adjacent to these creek valleys. Below 820 m, thin glaciolacustrine sediments of Glacial Lake Peace origin commonly overlie till deposits.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
M	SiCL	2-15	2-3	O.GL, BR.GL	Lodgepole pine/Low-bush cranberry/Wild sarsaparilla Aspen/Low-bush cranberry/Wild sarsaparilla
			4	G.GL	White spruce/Low-bush cranberry/Dewberry
$\frac{GFV}{M}$	$\frac{CL}{STCL}$	2-9	3-4	O.GL, GL.GL	Lodgepole pine/Low-bush cranberry/Wild sarsaparilla

Ecoregion: Boreal Foothills
Boreal Mixedwood

Ecological Conditions

A mixedwood forest of lodgepole pine and aspen occurs at higher elevations on these well-drained ridges, while aspen forest grows at lower elevations. Mature spruce stands are found in depressional terrain on uplands where more soil moisture is available.

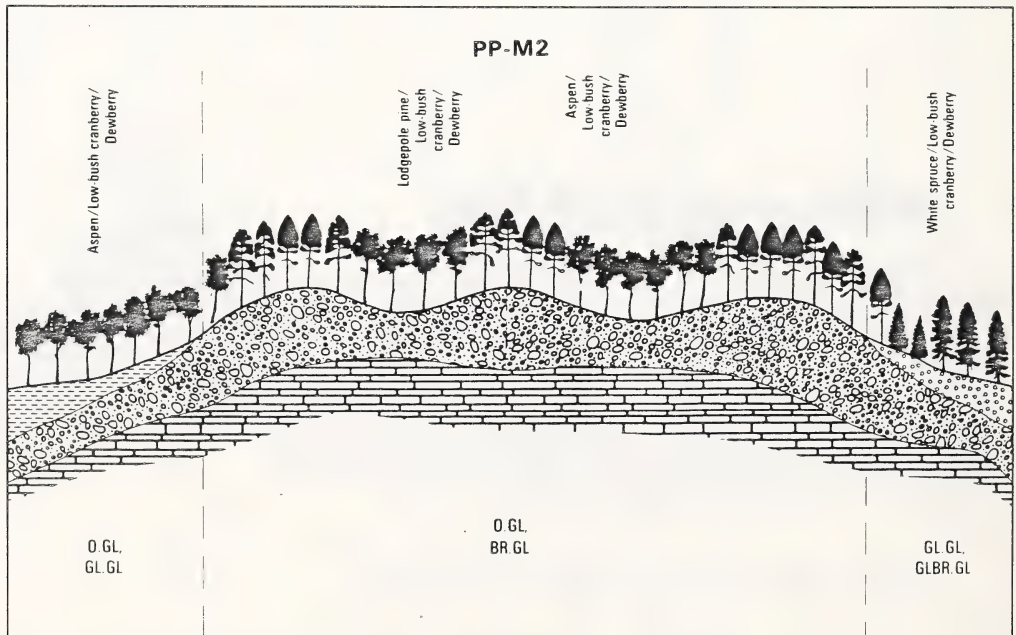


Figure 48: Schematic Diagram of Ecosection PP-M2

Physical Conditions

Moderately fine-textured Continental tills mantling an inclined to gently rolling bedrock ridge makes up the system (Figure 45). These till deposits in turn are overlain by eolian veneers and blankets which may have been derived from reworked glaciofluvial silts and sands from the Pinto Creek area. Eolian materials vary in thickness from 1-2 m on lower slope positions to 0.5 - 1'm on upper slope positions. Pronounced seepage occurs along the interface between eolian materials and the underlying till deposits. Gleysols have developed on level to depressional terrain at upper elevations where finer-textured tills and impermeable bedrock impede percolation of groundwater.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
Evb M	Si/SiL SiCL	0-9	2-3	BR.GL	Aspen/Low-bush cranberry/Dewberry
			3-4	BR.GL, E.EB, GLBR.GL, GLE.EB	Aspen/Balsam poplar/Bracted honeysuckle/ Dewberry
			4-5	GLBR.GL GLE.EB Gleysols	Aspen/Thimbleberry/Wild sarsaparilla White spruce/Bracted honeysuckle/Dewberry

Ecoregion: Boreal Mixedwood

Ecological Conditions

Seepage offsets the dryness of coarse-textured veneers and allows aspen and aspen-balsam poplar forest to cover this landscape. Shrub understories are rich and diverse because of the favorable moisture regime.

Physical Conditions

These nearly level to depressional topographic features are occupied by poorly to very poorly drained bogs and transitional fens (Figure 49). Occurring throughout the Pinto Plain, these organic accumulations of sedge and sphagnum peat are underlain by a combination of moderately-fine to fine-textured glaciolacustrine sediments and Continental tills.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
0	Mesic	0-2	5-6	Mesisols	Larch-Black spruce/Sedge/Sphagnum
$\frac{Ovb}{GL}$	$\frac{Mesic}{GL}$	0-2	5-6	Mesisols, Peaty Gleysols	Black spruce/Labrador tea/Feathermoss

Ecoregion: Boreal Mixedwood

Ecological Conditions

The pattern of vegetation is controlled by depth of the water table. Open black spruce covers most of the landscape in slightly elevated peat deposits. Open shrubby fen vegetation with scattered larch occurs along channels where moving groundwater is close to the surface.

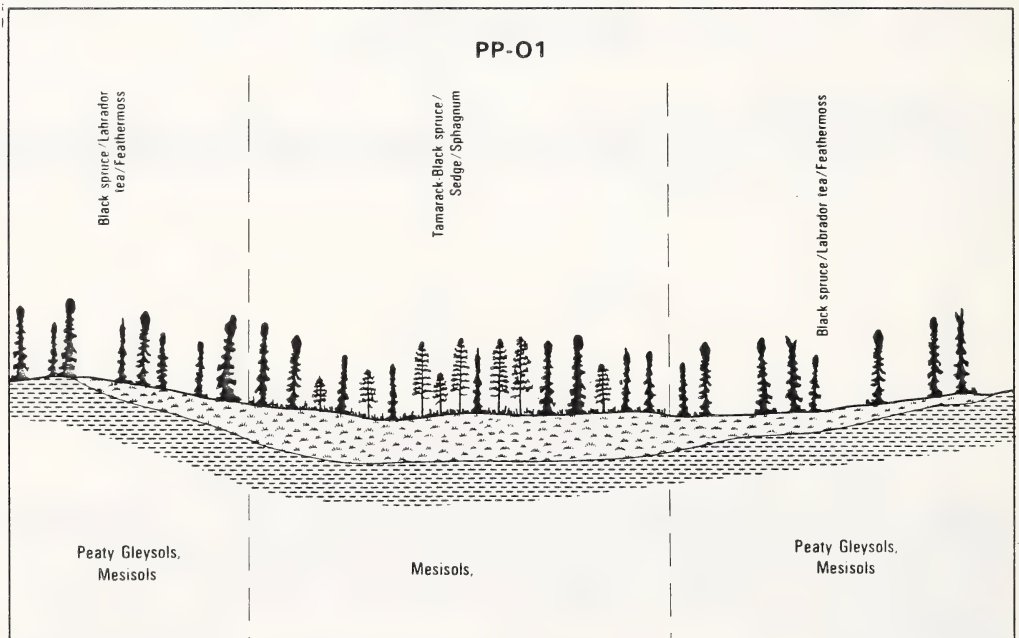


Figure 49: Schematic Diagram of Ecoregion PP-01

2.1.6 Smoky Plain Subregion (Ecodistrict)

Found in the northeastern portion of the study area (Figure 50) the Smoky Plain consists of a depressional to undulating glaciolacustrine plain. The bedrock, which is marked by thick surficial materials, is of the Wapiti Formation and is exposed locally within the deeply incised valleys of both the Simonette River and Lignite Creek. Across the subdued landscape, variations in elevation are minor with ranges of 625 m to 715 m on upland areas and 545 m to 640 m within the stream valleys. The subregions fall within the Boreal Mixedwood ecoregion, however, the vegetation is largely influenced by edaphic factors rather than regional climate.

Much of the area is characterized by large organic-eolian dune complexes. The thick organic deposits are dominated by wetland vegetation which consists of black spruce and sedge communities.

The eolian deposits which have been derived from reworked glaciofluvial outwash and deltaic materials are generally found in association with other surficial materials. Vegetation on these eolian materials consists of both aspen and lodgepole pine forests. Balsam poplar is also present where drainage is impeded.

Throughout the subregion significant amounts of glaciolacustrine sediments occur on higher positions in the landscape. Often these deposits are overlain by veneers of glaciofluvial sediments. Vegetation in these locations consists of a mixture of aspen/balsam poplar forests and black spruce.

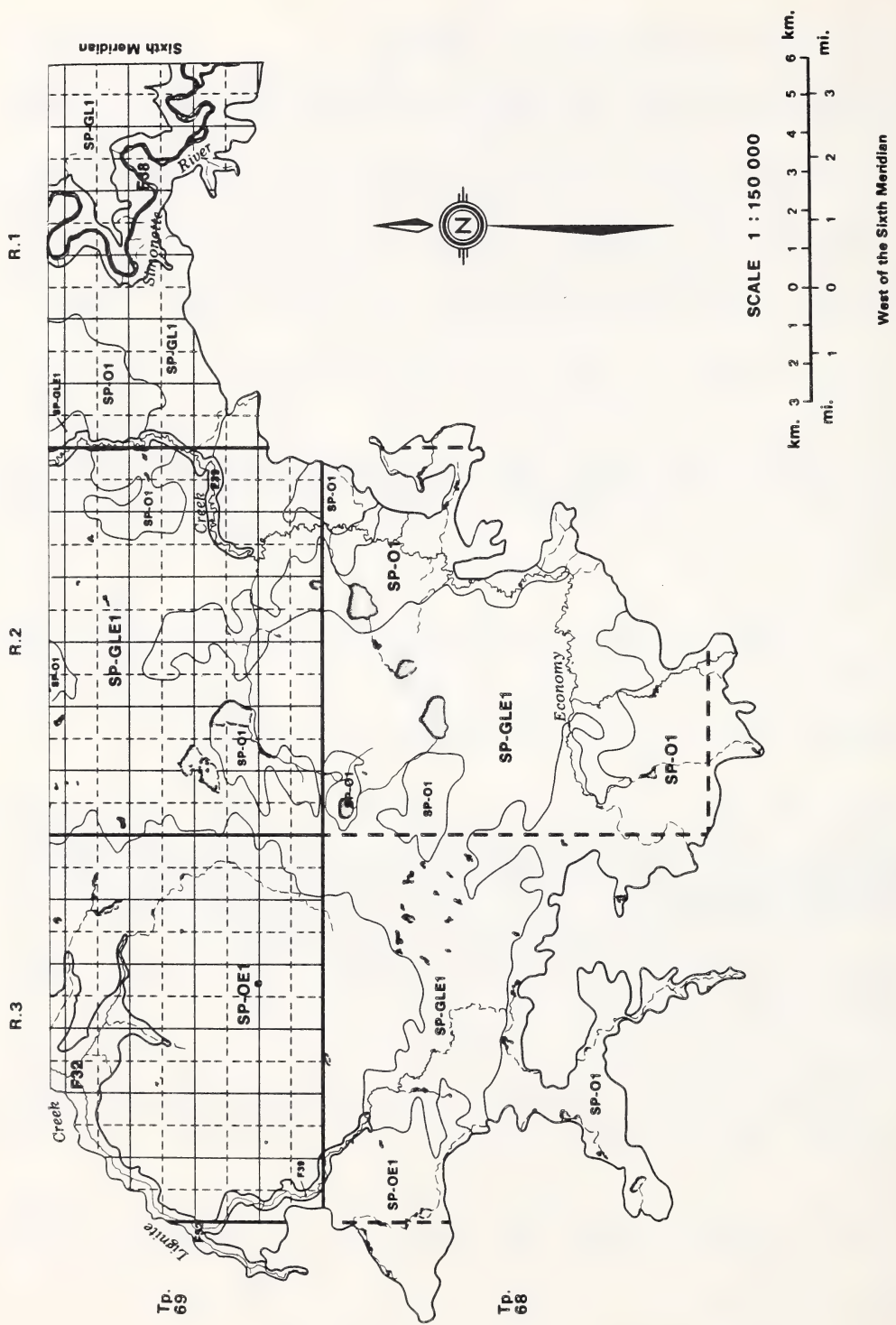


Figure 50: Smoky Plain Subregion (SP)

The subregion has been divided into four ecosections/systems. Landform, parent materials and vegetation found in each are displayed in Table 12. Detailed descriptions with accompanying schematic diagrams follow the table.

The Smoky Plain has three fluvial systems which were identified (F32, F38, F39). These are discussed in Section 2.5 of Volume I.

Table 12
ECOSECTIONS/SYSTEMS OF THE SMOKY PLAIN

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
SP-GL1	Gently undulating plain	Glaciolacustrine clay loam with overlays of silt and peat	Aspen, balsam poplar and open black spruce forest
SP-GLE1	Gently undulating plain	Glaciolacustrine clay with overlays of sand and peat	Aspen, balsam poplar and black spruce forest
SP-01	Depressional fens	Peat and silt over glaciolacustrine clay	Shrubby and treed muskeg, aspen and balsam poplar forest
SP-OE1	Level dune field	Peat and eolian sand	Sedge meadows, shrublands and open jackpine forest

Physical Conditions

This nearly level to gently undulating glaciolacustrine plain (Figure 51) is dissected by the Simonette River. These fine-textured, imperfectly to poorly drained sediments are overlain by thin veneers of glacioluvial and eolian materials. Small organic accumulations have developed through infilling of small ponds.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
GL	SiCL-CL	0-2	4-5	GL.GL, GLSZ.GL, Gleysols	Aspen-Balsam poplar/Bracted honeysuckle/ Dewberry
GFv, Ev	Si CL	0-2	3-4	O.GL, GL.GL	Aspen/Low-bush cranberry/Dewberry
Ovb GL	Mesic CL	0-2	5-6	Peaty Gley- sols, Mesic- sols	Black spruce/Labrador tea/Feathermoss

Ecoregion: Boreal Mixedwood

Ecological Conditions:

An abundance of soil moisture causes aspen-balsam poplar forest to predominate on these very gentle slopes. Pure stands of aspen are found adjacent to the valley of the Simonette River, where steep slopes improve drainage. Peat-filled depressions have dense shrub cover and an open canopy of black spruce.

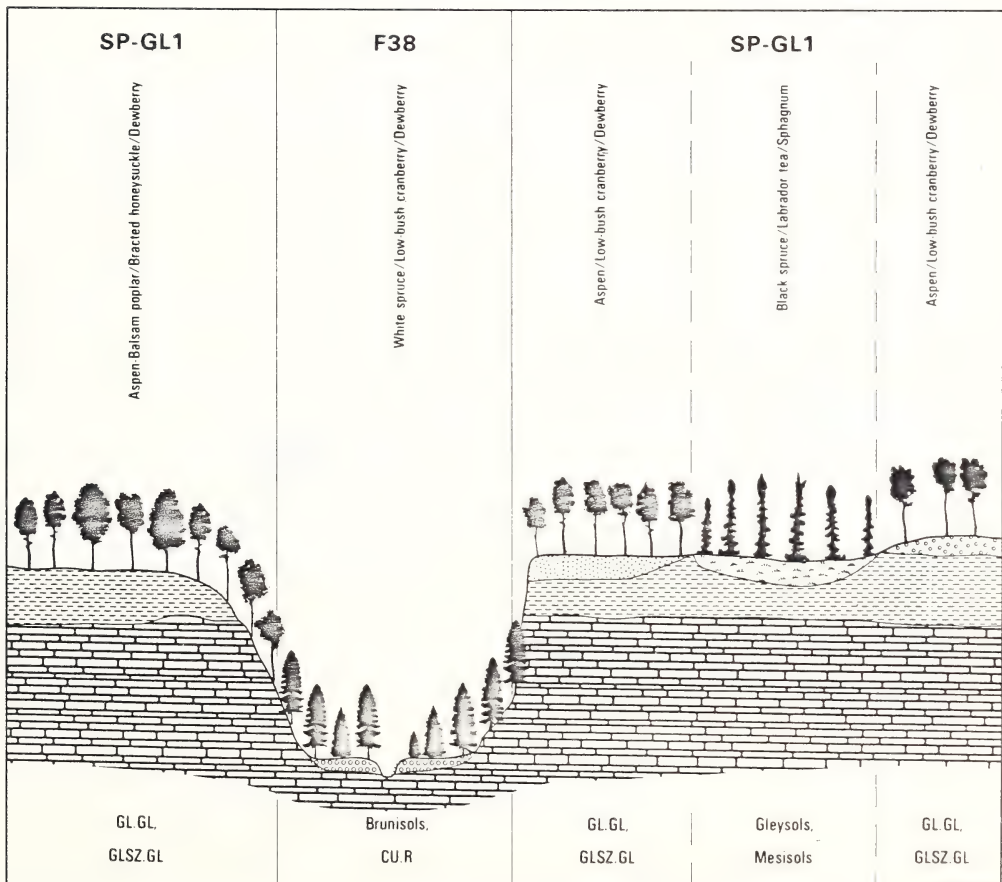


Figure 51: Schematic Diagram of Ecosections SP-GL1 and F38

Physical Conditions

This gently undulating glaciolacustrine plain (Figure 52) occurs between Lignite and Economy Creeks. Moderately fine to fine-textured glaciolacustrine sediments are mantled by eolian deposits of variable thicknesses. These include veneers, blankets and parabolic dunes. Scattered deposits of organics can also be found in areas between the dunes and other low-lying areas.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
E, Eb GL	S/Si C/CL	2-15	2	E.EB	Aspen/Rose/Pea vine
Ev GL	Si/S C/CL	0-2	2-3 4	BR.GL GLBR.GL	Aspen/Low-bush cranberry/Dewberry-Balsam poplar Aspen-Balsam poplar/Bracted honeysuckle/Dewberry
GL, Ov GL	C/CL	0-2	5	Gleysols	Black spruce/Labrador tea/Feathermoss

Ecoregion: Boreal Mixedwood

Ecological Conditions

Aspen forest covers most of this landscape, with its composition reflecting the thickness of sand deposits and soil drainage conditions. Low-lying terrain supports aspen-balsam poplar forest and a variety of shrubland communities dominated by willow, paper birch, white and black spruce and marsh reedgrass.

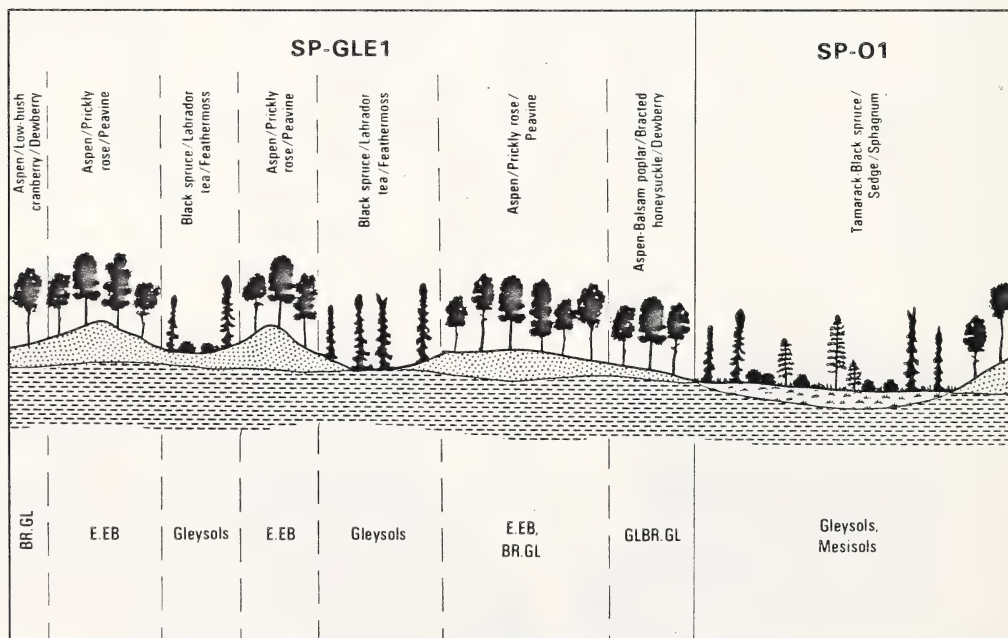


Figure 52: Schematic Diagram of Ecosystems SP-GLE1 and SP-O1

Physical Conditions

Scattered across the Smoky Plain, this system consists of a complex of organic fens (Figure 52) which have developed in depressional terrain and subdued meltwater channels. These deposits do not appear to be of great depth and are underlain by fine-textured, slowly permeable glaciolacustrine sediments. Also occurring across the system are small areas of glaciofluvial and eolian veneers overlying glaciolacustrine sediments.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
O, Ob GL	Mesic CL	0-2	6	Mesisols	Tamarack-Black spruce/Sphagnum
0v GL	Mesic CL	0-2	5-6	Peaty Gley- sols, Mesi- sols	Black spruce/Labrador tea/Feathermoss
GFv/Ev GL	Si CL	0-2	3-4	O.GL, GL.GL	Aspen-Balsam poplar/Bracted honeysuckle/ Dewberry

Ecoregion: Boreal Mixedwood

Ecological Conditions:

The vegetation pattern reflects an excess of soil moisture, with an open fen vegetation of sedges, willow and tamarack occurring in subdued glacial meltwater channels and around ponds. Black spruce forest is found in the headwater areas of meltwater channels where there is a slight improvement in drainage. Elevated deposits of glaciofluvial and aeolian silt present the driest environment and support aspen-balsam poplar forest.

Physical Conditions:

Found in the vicinity of and east of Lignite Creek, this system consists of a complex of extensive accumulations of sedge and sphagnum peats and prominent parabolic dunes (Figure 53). The entire system is underlain at depth by fine-textured slowly permeable glaciolacustrine sediments.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
O, Ob GL	Mesic CL	0-2	6	Mesisols	Larch-Black spruce/Sedge/Sphagnum
E	S	2-15	1-2	E.EB	Lodgepole pine/Blueberry/Lichen

Ecoregion: Boreal Mixedwood

Ecological Conditions:

Excessive moisture characterizes most of this landscape on which open wetland vegetation of sedges, willow and large predominates. The rapidly-drained environment of large dunes supports open jackpine forest, whereas deciduous forest is found on thinner aeolian deposits that occur elsewhere in the subregion.

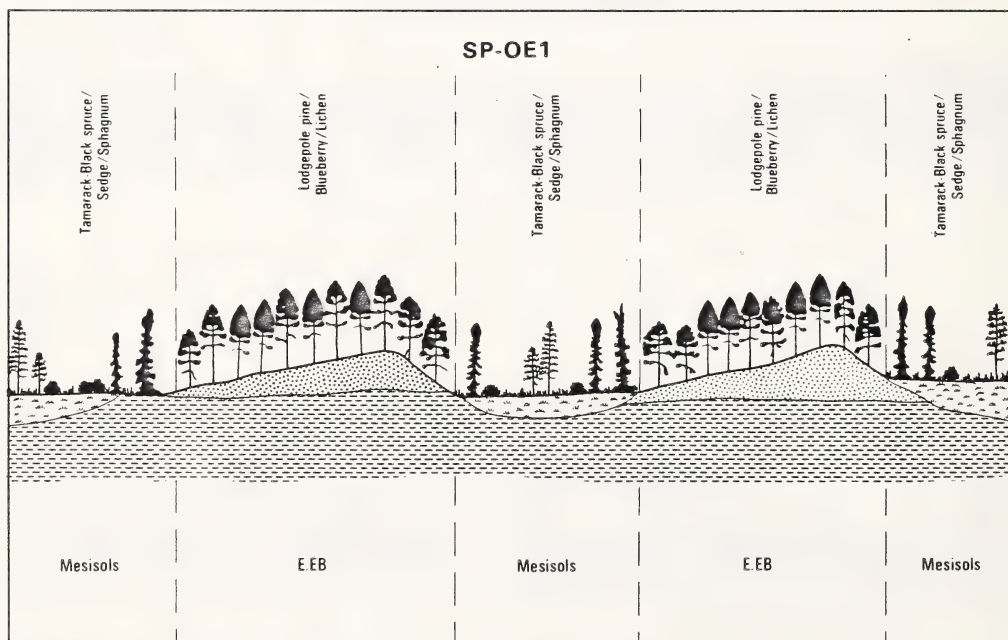


Figure 53: Schematic Diagram of Ecosystem SP-OE1

2.2 Western Alberta Plains Region

The Western Alberta Plains lies within the central portion of the study area between the Wapiti Plains and the Rocky Mountain Foothills Regions (Figure 7). Elevations range from 820 m within the Smoky River valley to 1 525 m atop Nose Mountain. Local relief is highly variable.

The region is underlain by gently dipping bedrock of the Paskapoo Formation. The Scollard Member which is part of this formation is very prone to slumping and outcrops along most of the major river valleys. Structural deformation is not common, however minor distortion of the bedrock occurs adjacent to the Rocky Mountain Foothills.

The general landscape of the region consists of an eroded benchland. It is characterized by gently undulating to rolling plateau remnants and strongly dissected, steep sided slopes. The landforms are bedrock controlled and overlain by surficial deposits of variable thickness.

Surficial materials of this region are a complex of both Cordilleran and Continental till. Where these deposits are thin, residual sandstone materials often predominate. Post glacial erosion has also resulted in heavily eroded slopes with colluvium materials very prominent. On the higher plateau remnants, a highly cemented pre-glacial gravel cap is also found. In addition, varied amounts of organic, glaciofluvial and fluvial materials are present.

The Western Alberta Plain lies within parts of the Boreal Foothills, Boreal Uplands and Subalpine ecoregions. This gives rise to a varied vegetation across the region. Aspen, white spruce and lodgepole pine forest are common on modal sites with other species occurring occasionally. The prominence of aspen decreases while lodgepole pine increases with increasing elevation.

The region has been subdivided into nine subregions/ecodistricts. Topography, surficial materials and vegetation within each subregion are shown in Table 13.

Table 13
MAJOR CHARACTERISTICS OF THE SUBREGIONS IN THE WESTERN ALBERTA PLAINS

SUBREGION	TOPOGRAPHY	SURFICIAL MATERIAL	VEGETATION
Cutbank Benchlands	Dissected side slopes and plateau remnants	Moraine, colluvium	Aspen, lodgepole pine, white spruce
Cutbank Plateau	Plateau remnants and dissected side slopes	Moraine, residual, colluvium	Lodgepole pine, white spruce, aspen, Engelmann x white spruce
Deep Valley Plateau	Tertiary pediment	Preglacial gravels, organic, colluvium	Black spruce, tamarack, lodgepole pine, white spruce
Kakwa Benchlands	Ridged upland	Moraine, residual, colluvium	Lodgepole pine, black spruce, aspen
Little Smoky Plain	Rolling plain and side slopes	Moraine, glacio-fluvial veneers, organics	Lodgepole pine, black spruce
Little Smoky Valley	Glacial outwash channel	Glaciofluvial, organic, moraine	Black spruce, lodgepole pine
Narraway Benchlands	Rolling to fluted till plain	Moraine, colluvium, organic	Lodgepole pine, black spruce, white spruce, aspen
Simonette Benchlands	Rolling to ridged upland	Moraine, eolian	Aspen, white spruce, lodgepole pine
Simonette Uplands	Rolling to level plateau remnants with dissected side slopes	Moraine, residual colluvium	Aspen, lodgepole pine, white spruce, black spruce

*Note: Bedrock across the region is gently dipping strata of the Paskapoo Formation.

2.2.1 Cutbank Benchlands Subregion (Ecodistrict)

Found along the eastern edge of the Western Alberta Plains (Figure 54), the Cutbank Benchlands consists of a heavily dissected plateau remnant which is characterized by rolling ridges and eroded side slopes. The area is underlain by gently dipping bedrock of the Paskapoo Formation which is exposed along the valleys of the Cutbank, Kakwa and Wapiti Rivers and their tributaries.

With an increase in elevation from east to west (800 m to 1 220 m) the subregion includes portions of two ecoregions; the Boreal Foothills and Boreal Uplands.

Ground moraine of continental origin is the dominant surficial material and decreases in thickness from east to west. Aspen and lodgepole pine forests predominate on thicker deposits at lower elevations. A much stonier cordilleran till is found at higher elevations and lodgepole pine is found on modal sites where deposits are thin. Numerous fluting marks indicate that ice moved from the northwest to southeast across the subregion.

Along the major stream valleys and steep upper slopes, colluvium deposits are quite extensive. Oversteepening by downcutting streams, combined with mass wasting where soft bedrock of the Scollard Member is exposed, often creates unstable slopes. The vegetation pattern is greatly influenced by pronounced seepage and groundwater movements which are contributing to instability of materials. Aspen and white spruce forest with significant amounts of alder appear to be wide-spread with

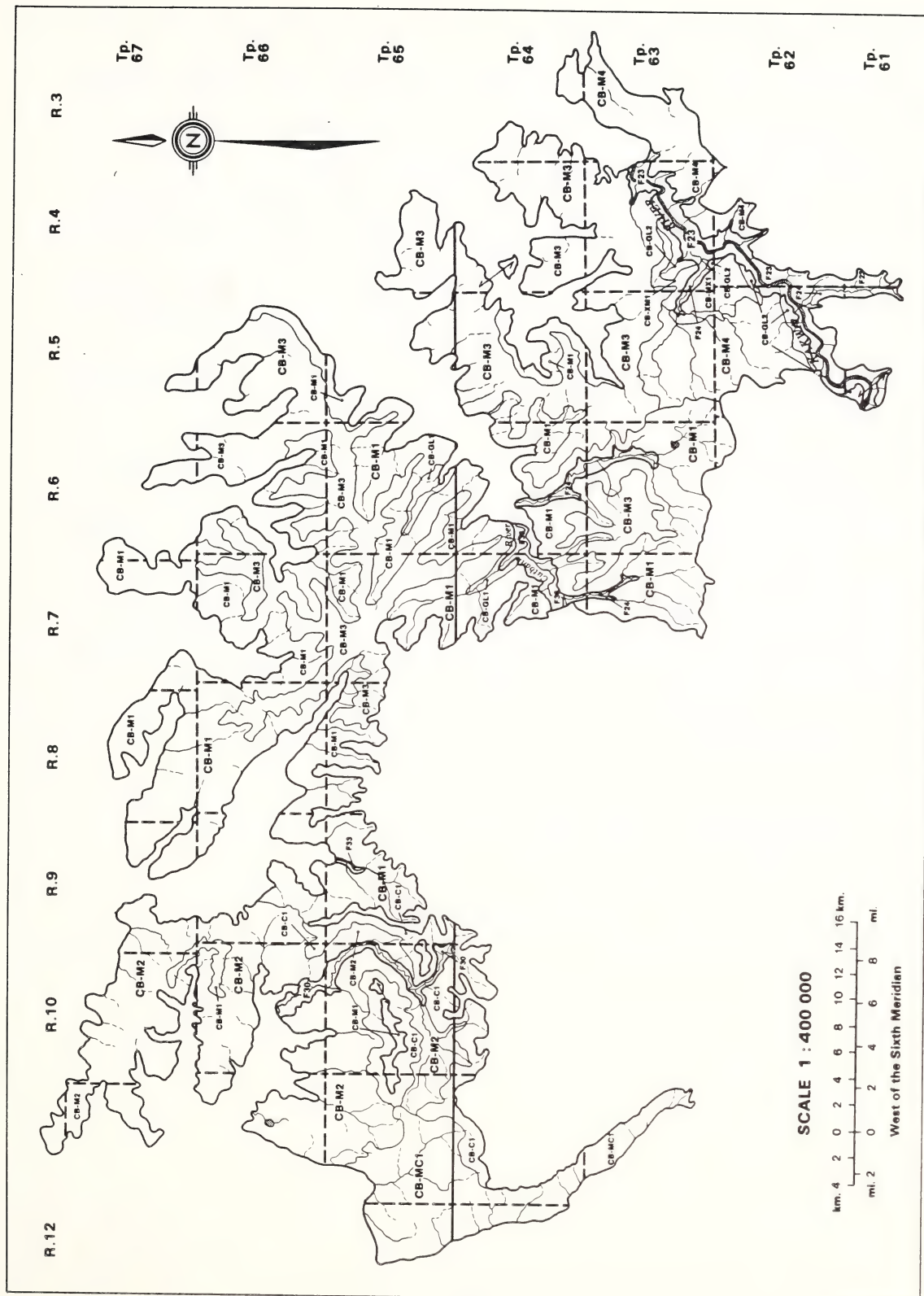


Figure 54: Cutbank Benchlands Subregion (CB)

lodgepole pine forest at higher elevations on plateau remnants. Extensive, recently burned areas at lower elevations currently support dense seral shrubland dominated by willow and alder.

The northern portion of the subregion contain relic shoreline features indicative of fluctuating levels of former glacial Lake Peace. Glaciolacustrine materials can also be found in these areas with a varied vegetation cover reflecting drainage and aspect. A mixture of aspen, white spruce, black spruce and lodgepole pine is common.

The Cutbank Benchland subregion is divided into ten systems/ecosections (Table 14) which reflect the complex nature of the landscape. Several fluvial systems occur across the subregion (F21, F23, F24, F30, F36), their characteristics are discussed in Section 2.5 of Volume I.

Table 14

SUMMARY OF THE ECOSECTIONS/SYSTEMS IN THE CUTBANK BENCHLANDS SUBREGION/ECODISTRICT

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
CB-C1	Steep, dissected slopes	Medium-textured colluvium	Lodgepole pine and white spruce forest
CB-GL1	Gently sloping tributary valleys	Glaciolacustrine clay with sandy overlays	Black spruce and black spruce-pine forest muskeg
CB-GL2	Undulating terraces	Thin peat over glaciolacustrine clay	Black spruce and black spruce-lodgepole pine forest
CB-M1	Steep-sided, dissected headwater valleys	Moderately fine-textured till	Aspen and white spruce and lodgepole pine forest
CB-M2	Undulating benchland	Moderately fine-textured till with sandy overlays	Aspen, lodgepole pine and white spruce forest
CB-M3	Gently undulating plateau	Medium to moderately fine-textured till	Lodgepole pine, aspen and white spruce forest
CB-M4	Rolling ridges	Moderately fine-textured till	Lodgepole pine, black spruce and white spruce forest
CB-MC1	Undulating benchlands and steep-sided valleys	Moderately fine-textured till and moderately coarse-textured colluvium	Lodgepole pine, aspen and white spruce forest
CB-M01	Gently rolling ridges	Medium-textured continental till and thin peat	Lodgepole pine, white spruce and black spruce forest, muskeg
CB-MX1	Steep slopes	Thin, medium-textured till and colluvium	White spruce and aspen forest

Physical Conditions:

Representing the side slopes of a glacier carved valley (Figure 55), this moderate to steeply sloping system has subsequently been eroded by the headwater tributary streams of Muddy Creek. Extensive slumping occurs throughout this system as a result of the easily erodable bentonitic sandstones and shales which are interbedded within the underlying Paskapoo Formation. Surficial materials consist of colluvium derived from Continental tills deposited on the adjacent Cutbank Plateau and from locally weathered bedrock materials.

Materials	Texture	Slope	Drainage	Soils	Plant Association
Cvb R	SiCL/SL	31-45	2	O.R, O.DYB, E.DYB	Lodgepole pine/Alder/Dewberry/ Aspen/Buffaloberry/Showy aster
		16-30	2-4	E.EB, E.EB	White spruce/Low-bush cranberry/ Dewberry White spruce/Common horsetail Aspen/Low-bush cranberry/Wild sarsaparilla Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla

Ecoregion: Boreal Uplands
Boreal Foothills

Ecological Conditions

The vegetation pattern reflects the influence of slope, aspect and seepage. Lodgepole pine forest occurs on neutral and northern exposures, with high cover of alder reflecting pronounced seepage along north-dipping bedrock strata. White spruce forest is found on lower slopes and in headwater valleys where seepage water concentrates. Dry southern exposures support aspen forest.

Large portions of this landscape have been burned. Generally favorable soil moisture has allowed dense willow and alder shrubland to develop on burned areas, and dense shrub cover has slowed forest succession.

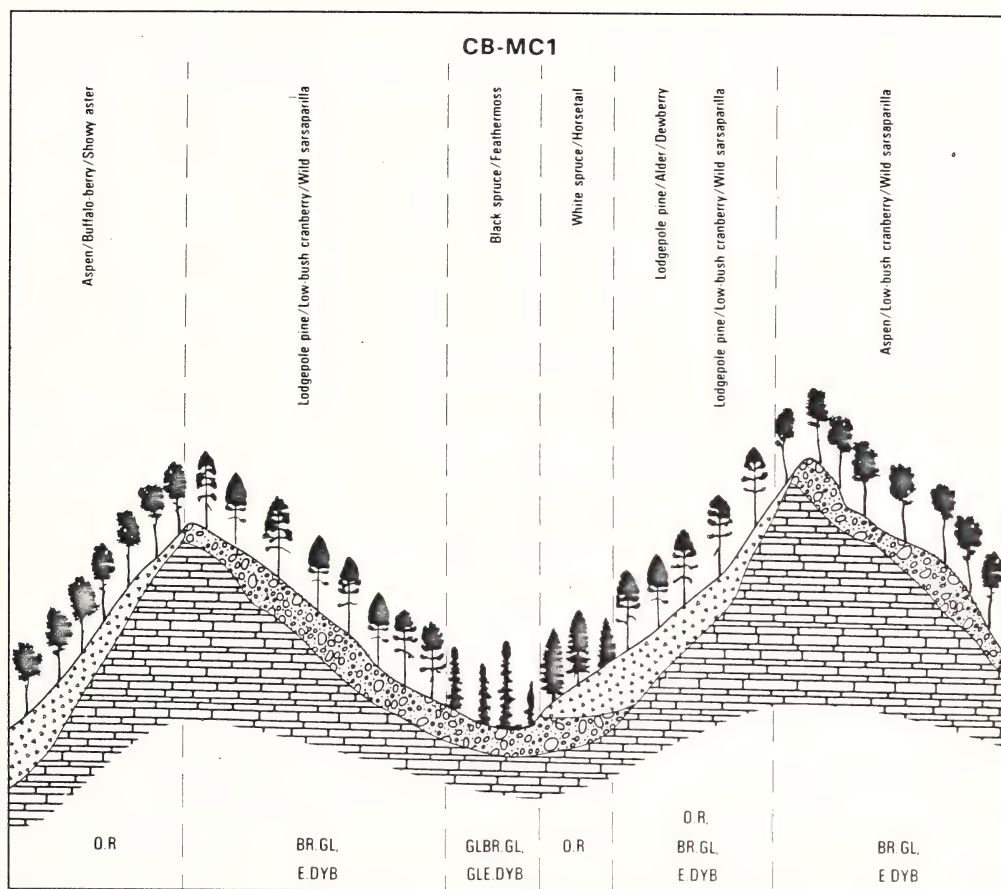


Figure 62: Schematic Diagram of Ecosection CB-MC1

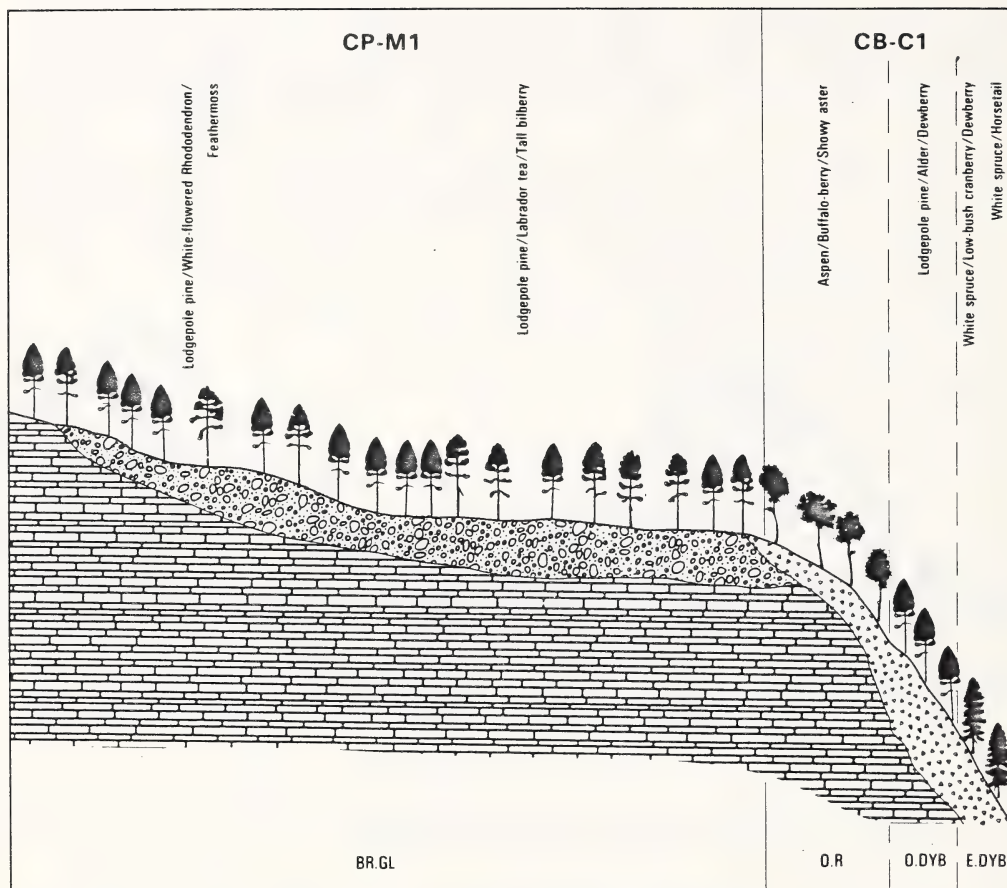


Figure 55: Schematic Diagram of Ecosections CB-C1 and CP-M1

CB-GL1

Physical Conditions:

These small side valleys of the Cutbank River consists of poorly drained glaciolacustrine sediments with fluvial aprons covering these materials at the base of adjacent slopes (Figure 56). Surface expression of these moderately fine-textured sediments is gently sloping to undulating.

Materials	Texture	Slope	Drainage	Soils	Plant Association
Ov GL	Mesic STC	0-2	4-5	Peaty Gleysols, GL.GL	Black spruce/Feathermoss Tamarack-Black spruce/Dwarf birch/ Sphagnum
Fv GL	Sil STC	2-9	3-4	O.GL, GL.GL	Lodgepole pine-Black spruce/ Labrador tea/Feathermoss

Ecoregion: Boreal Foothills

Ecological Conditions

Generally poor drainage allows deciduous shrubland and open black spruce forest to cover most of the valley floor. Black spruce-lodgepole pine forest is found on fluvial aprons that are somewhat better drained.

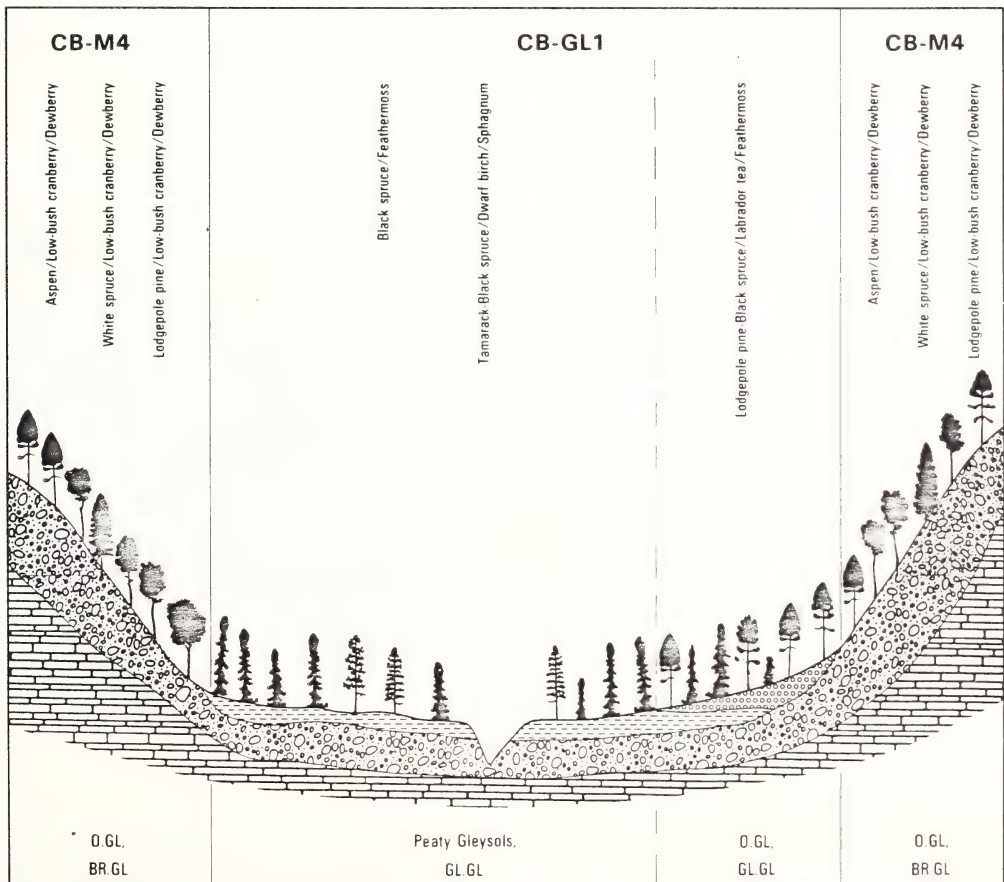


Figure 56: Schematic Diagram of Ecosections CB-GL1 and CB-M4

Physical Conditions

This system includes several nearly level to gently undulating glaciolacustrine terraces bordering the Kakwa River (Figure 57). Moderately fine-textured glaciolacustrine sediments are commonly overlain by thin organic veneers. The prevalence of these veneers has resulted from pronounced groundwater discharge from adjacent ecosections combined with the slowly permeable underlying sediments.

Materials	Texture	Slope	Drainage	Soils	Plant Association
Ov, GL GL	Mesic STC/STC	0-2	4-5	Peaty Gley- soils, GL.GL	Black spruce/Feathermoss Lodgepole pine-Black spruce/ Labrador tea/Feathermoss

Ecoregion: Boreal Foothills

Ecological Conditions

Black spruce forest covers these terraces because of poor drainage. This grades into a mixed black spruce-lodgepole pine forest near the slopes of the Kakwa River valley where drainage is improved.

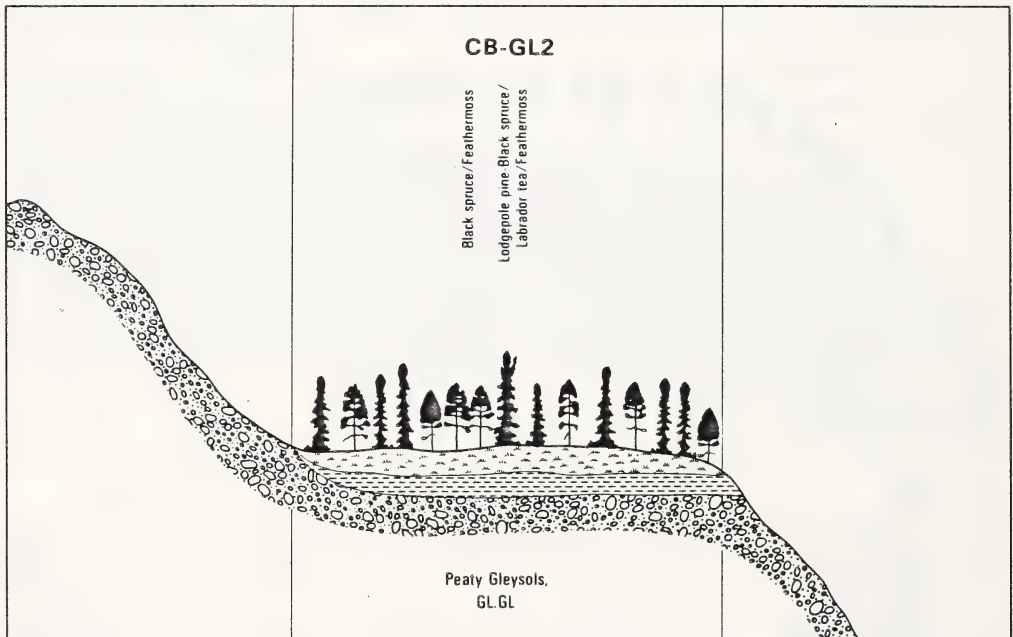


Figure 57: Schematic Diagram of Ecosection CB-GL2

Physical Conditions:

This system is a former part of the Cutbank Plateau which has been eroded by the headwater streams of Pinto, Big Mountain and Bald Mountain Creeks and several unnamed tributary streams of the Cutbank River (Figure 58). These moderate to strongly sloping headwater valleys are covered primarily with thick Continental tills, however, small areas of slumping on steep upper slopes (25-34%) have exposed residual sandstone materials of the Paskapoo Formation. Colluvial veneers are common at the base of slumps. Fluvial veneers derived from slope wash are common at the base of lower slopes. Seepage and groundwater discharge areas are common throughout this system

Materials	Texture	Slope	Drainage	Soils	Plant Association
M, $\frac{Mv}{R}$	SiCL/SiL	6-25	2-4	O.GL, BR.GL, GL.GL, Gley-soils	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Aspen/Low-bush cranberry/Dewberry
		2-9	4-5	Gleysols, GL.GL	Lodgepole pine-Black spruce/ Labrador tea/Feathermoss Black spruce/Feathermoss
$\frac{Fv}{M}$		6-9	5	Gleysols	White spruce/Common horsetail

Ecoregion: Boreal Foothills

Ecological Conditions

These slopes support a mixed forest of aspen, lodgepole pine and white spruce that is typical of mesic conditions in the Boreal Foothills ecoregion. White spruce stands are common in seepage tracks where moving groundwater is a factor. Groundwater discharge areas at the base of slopes support black spruce-lodgepole pine forest.

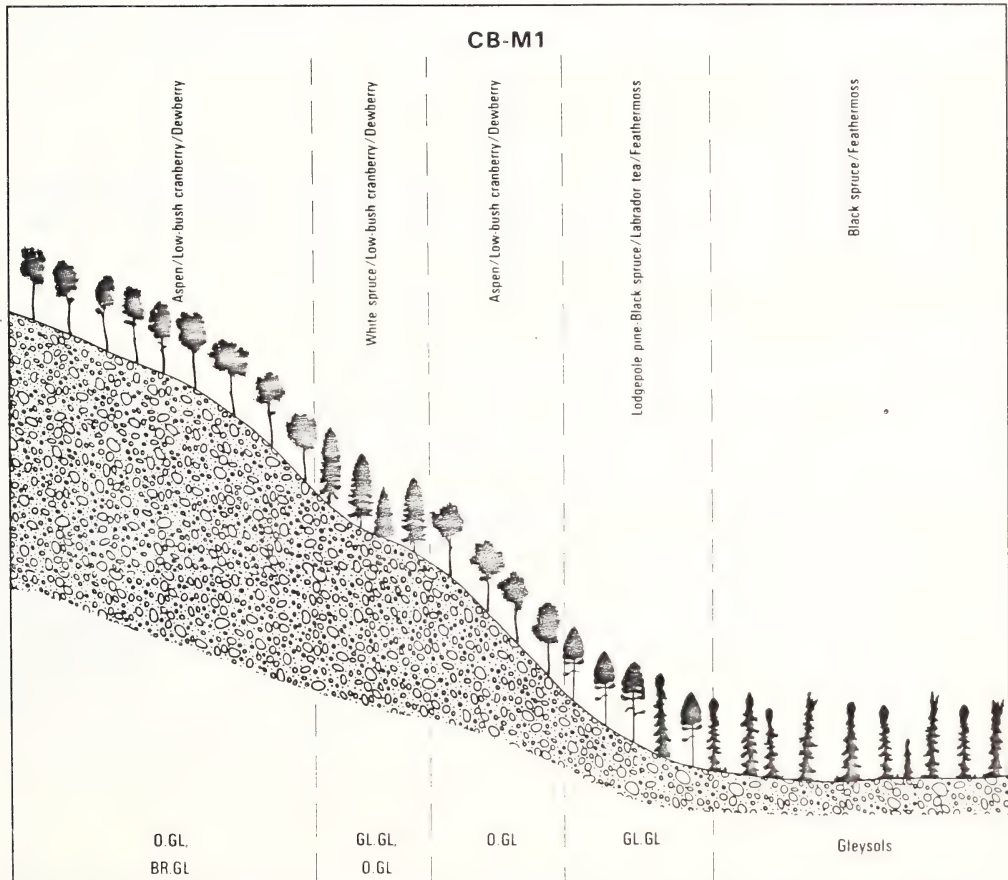


Figure 58: Schematic Diagram of Ecosection CB-M1

Physical Conditions:

This system represents a part of a glacially eroded valley that has been dissected by Muddy Creek and its tributaries (Figure 5). Surface expression varies from rolling and ridged to gently inclined.

The principal surficial materials throughout the system are moderately fine textured Continental tills which are commonly overlain by thin fluvial and/or glaciofluvial veneers. Coarse to medium textured glaciofluvial veneers and small esker complexes are common in the western portion of the area and are the result of glacial meltwaters which flowed from the southwest. Fluvial veneers derived from slope wash commonly overlie ground moraine in the eastern portion of the ecosection. Erosion of tills on subdued bedrock ridges has resulted in the exposure of residual sandstone materials.

Materials	Texture	Slope	Drainage	Soils	Plant Associations
$M, \frac{GFv}{M}, \frac{Xv}{R}$	$\frac{SL}{STCL}$	2-9	2-3	BR.GL	Aspen/Low-bush cranberry/Wild sarsaparilla Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla
$M, \frac{Fv}{M}$	$\frac{Si}{STCL}$	0-6	4-5	GL.GL, Gleysols	White spruce/Low-bush cranberry/ Wild sarsaparilla
GF	S	2-9	2	E.EB, O.EB	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla

Ecoregion: Boreal Foothills

Ecological Conditions

Most of this landscape is covered by aspen forest, along with successional deciduous shrubland dominated by aspen, willow and alder. Lodgepole pine forest occurs under drier than average conditions on glaciofluvial sands and on ridge tops where surficial materials are thin. Fluvial veneers fed by seepage water in the eastern part of the area support white spruce forest.

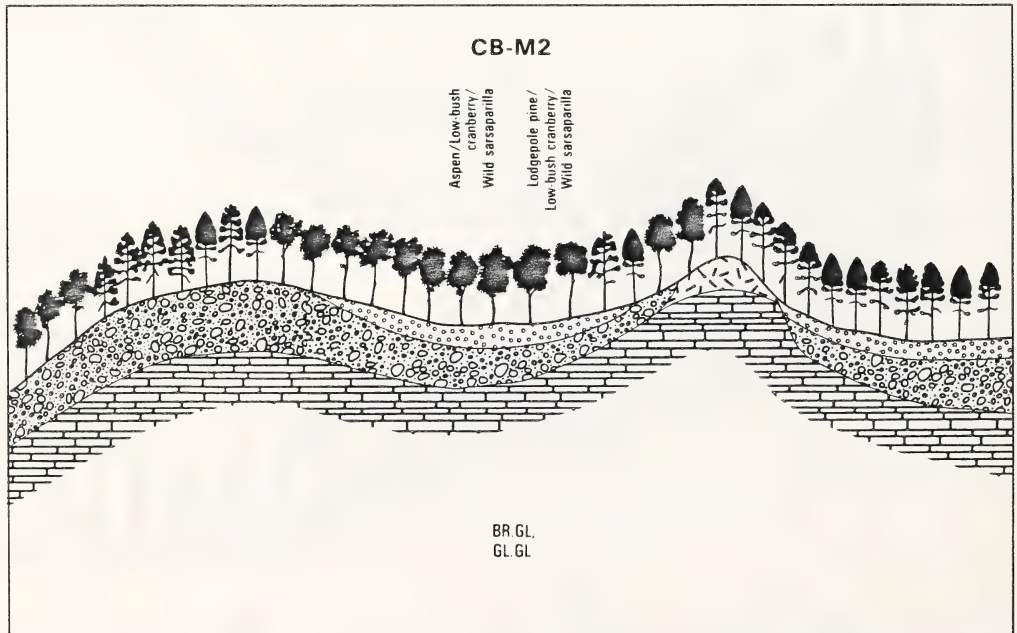


Figure 59: Schematic Diagram of Ecosection CB-M2

Physical Conditions:

This gently undulating to rolling plateau (Figure 60) is dissected by the Cutbank River and consists chiefly of moderately fine-textured Continental tills, with residual sandstone materials where tills have been eroded away. Moderately fine to fine-textured glaciolacustrine sediments occur on lower slopes.

Materials	Texture	Slope	Drainage	Soils	Plant Association
$\frac{Mvb, Xv}{R \quad R}$	SiL-SiCL	3-9	2-3	O.GL, BR.GL	Aspen/Low-bush cranberry/Dewberry Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla
$\frac{Mvb, GLv}{R \quad M}$	$\frac{CL}{STCL}$	2-6	3-4	O.GL, BR.GL, GLBR.GL, Gleysols	White spruce/Low-bush cranberry/ Dewberry

Ecoregion: Boreal Foothills

Ecological Conditions

Topography, drainage patterns and exposure influence the vegetation pattern on this landscape. Aspen forest tends to predominate on slopes, both on northern exposures receiving seepage water where it is found with white spruce and balsam poplar, and on drier southern exposures. White spruce forest also occurs in moister valley bottoms and on depressional terrain on uplands. Lodgepole pine forest is found on nearly level upland sites.

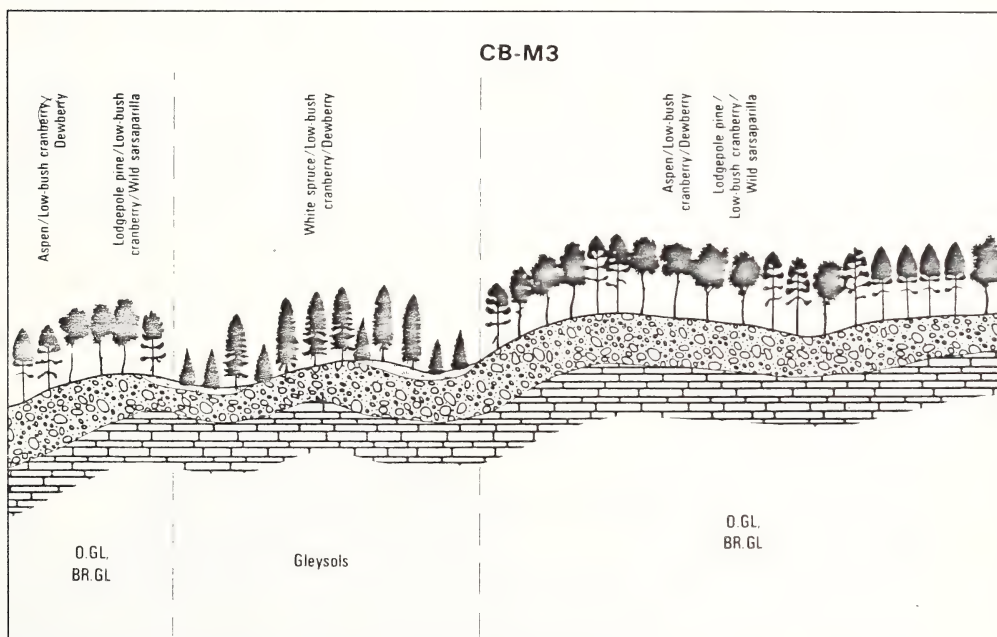


Figure 60: Schematic Diagram of Ecosection CB-M3

Physical Conditions:

Situated on subdued to gently inclined upland areas adjacent to the Kakwa River (Figure 61) this system consists of a series of east trending bedrock ridges that are covered by thick deposits of Continental till. These ridges are separated by wide, but relatively subdued valleys in which Gleysols have developed.

Materials	Texture	Slope	Drainage	Soils	Plant Association
M, Mb R	SiL	0-15	2-3	O.GL, BR.GL	White spruce/Low-bush cranberry/ Dewberry Aspen/Low-bush cranberry/Wild sarsaparilla Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla
			4-5	GL.GL, Gleysols	Lodgepole pine-Black spruce/ Labrador tea/Feathermoss Black spruce/Feathermoss

Ecoregion: Boreal Foothills

Ecological Conditions

Much of the upland forest in this ecosection has been clearcut and currently supports successional shrubland dominated by willow, aspen and reedgrass. Lodgepole pine and white spruce forest are found on uplands between the Kakwa and Smoky rivers where clearcutting has not taken place. Subdued valleys are wetter than the uplands and support a mixed black spruce-lodgepole pine forest.

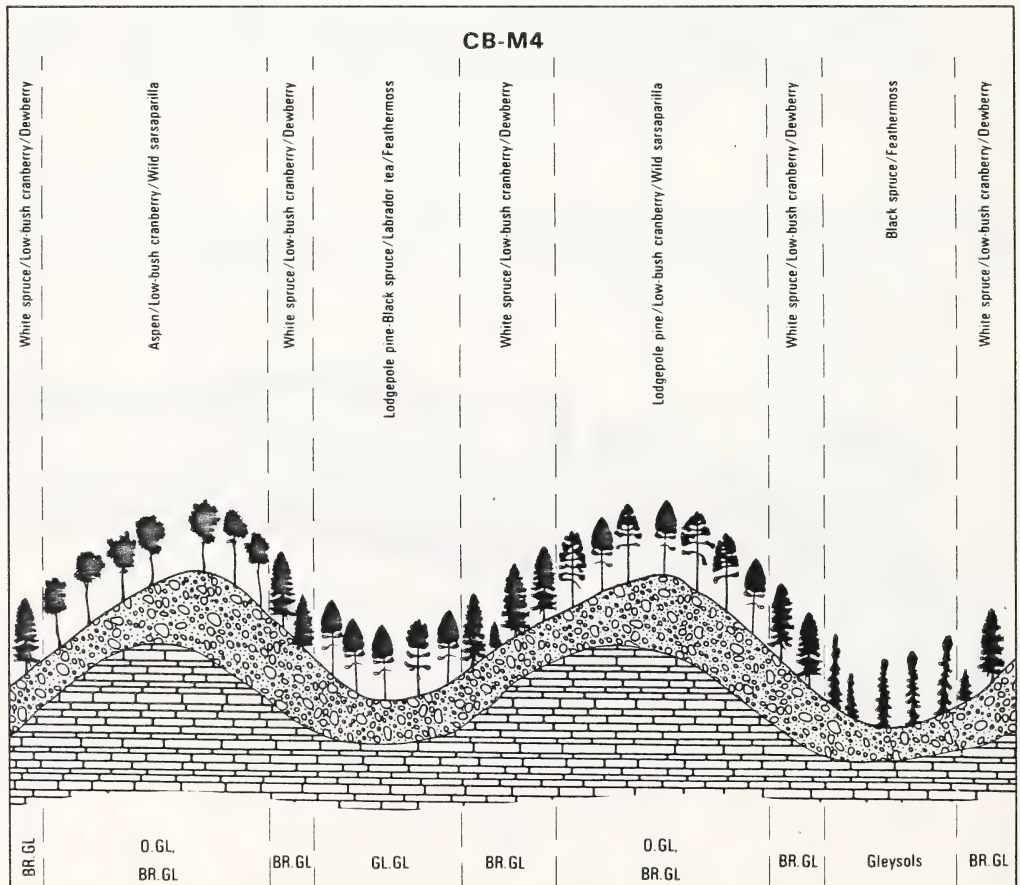


Figure 61: Schematic Diagram of Ecosection CB-M4

CB-MC1

Physical Conditions:

These highly eroded benchlands (Figure 62) are found between Nose Creek and Nose Mountain. The headwater streams of Grayling and Little Grayling Creeks have dissected this bedrock controlled landscape. Continental tills are the principal surficial materials, however, these have been modified by colluvial and fluvial processes. This action has left thin till veneers on benchlands with thicker deposits accumulating in valley bottoms, often masking the underlying parent material.

Materials	Texture	Slope	Drainage	Soils	Plant Association
M, $\frac{M/Xvb}{R}$	SiL/LS	2-9	2-3	BR.GL, E.DYB	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Aspen/Low-bush cranberry/Wild sarsaparilla
$\frac{F/Cvb}{M}$	SiL/LS	2-15	3-4	BR.GL, E.DYB, GLBR.GL, GLE.DYB	White spruce/Low-bush cranberry/ Dewberry White spruce/Common horsetail Black spruce/Feathermoss
$\frac{Cv}{R}$	LS	16-45	1-2	O.R	Lodgepole pine/Alder/Dewberry/ Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Aspen/Buffalo-berry/Showy aster

Ecoregion: Boreal Foothills
Boreal Uplands

Ecological Conditions

Most of this ecosection has been burned in the recent past and currently supports successional shrubland dominated by willow and alder. The composition of remaining forest stands indicates that exposure will have considerable influence on forest regeneration on this ridged landscape, with white spruce forest on northern exposures and moist lower slopes, a mixture of lodgepole pine and aspen on neutral exposures, and aspen forest on dry southern exposures.

Physical Conditions:

Lying on the north side of the Kakwa River, this system consists of subdued to rolling morainal materials with extensive organic deposits developed in depressional terrain (Figure 63). Small morainal ridges indicate that ablation till deposits of Continental origin are common. Some residual sandstone materials are found in this area.

Material	Texture	Slope	Drainage	Soils	Plant Association
M	SiL-SiCL	0-15	3-4 2-3	O.GL, GL.GL O.GL	Lodgepole pine-Black spruce/ Labrador tea/Feathermoss White spruce/Low-bush cranberry/ Dewberry Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Aspen/Low-bush cranberry/Wild sarsaparilla
$\frac{Ovb}{M}$	Mesic SiCL	0-6	5-6	Peaty Gley- sols, Mesi- sols	Black spruce/Feathermoss Tamarack-Black spruce/Dwarf birch/ Sphagnum

Ecoregion: Boreal Foothills

Ecological Conditions

Most of this landscape consists of imperfectly to poorly drained lowlands, with the vegetation grading from black spruce-lodgepole pine forest to black spruce forest and muskeg as soil moisture levels increase. Better drained uplands support mixedwood forest with white spruce and lodgepole pine predominating. Large portions of the upland forest have been clearcut, however, and these clearcuts currently support successional shrubland.

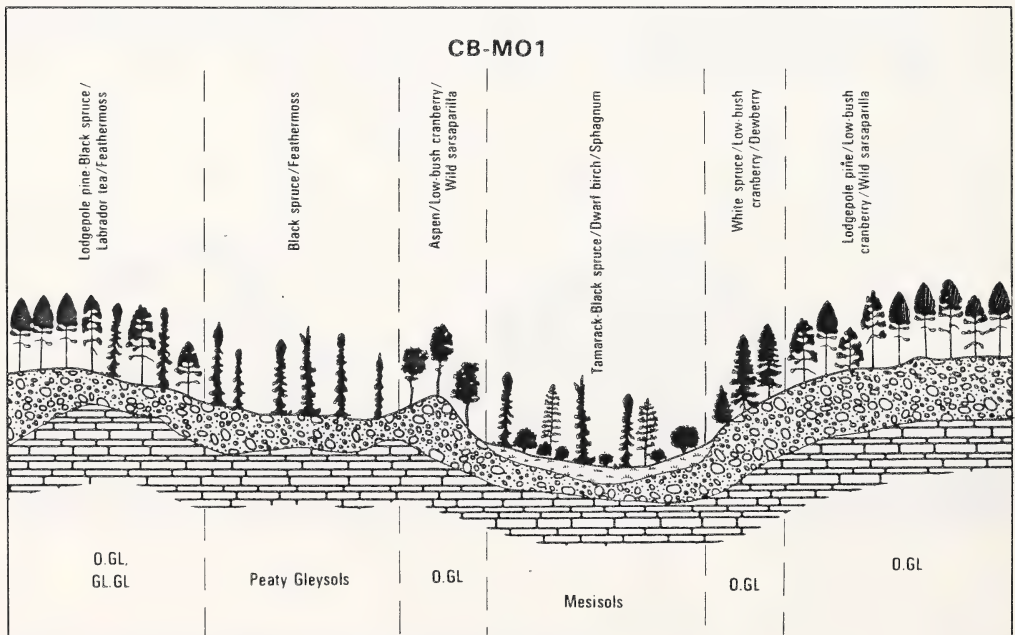


Figure 63: Schematic Diagram of Ecoregion CB-M01

Physical Conditions:

This system (Figure 64) consists of residual sandstone materials and thin deposits of Continental till overlying bedrock along the upper slopes of the Kakwa River valley. Bedrock strata of the Paskapoo Formation are generally very close to the surface and may be exposed in places. Surface expression varies from rolling to inclined with slopes ranging from moderate to very strong.

Materials	Texture	Slope	Drainage	Soils	Plant Association
$\frac{Xvb/Mv}{R}$	SiCL-SiL	15-45	2-3	O.GL, BR.GL, E.EB	White spruce/Low-bush cranberry/ Dewberry Aspen/Low-bush cranberry/Wild sarsaparilla

Ecoregion: Boreal Foothills

Ecological Conditions

Most of the forest vegetation on these slopes has been clearcut and currently supports successional shrubland. White spruce and aspen dominate the remaining forest areas, with lodgepole pine much less common than it is elsewhere in the subregion.

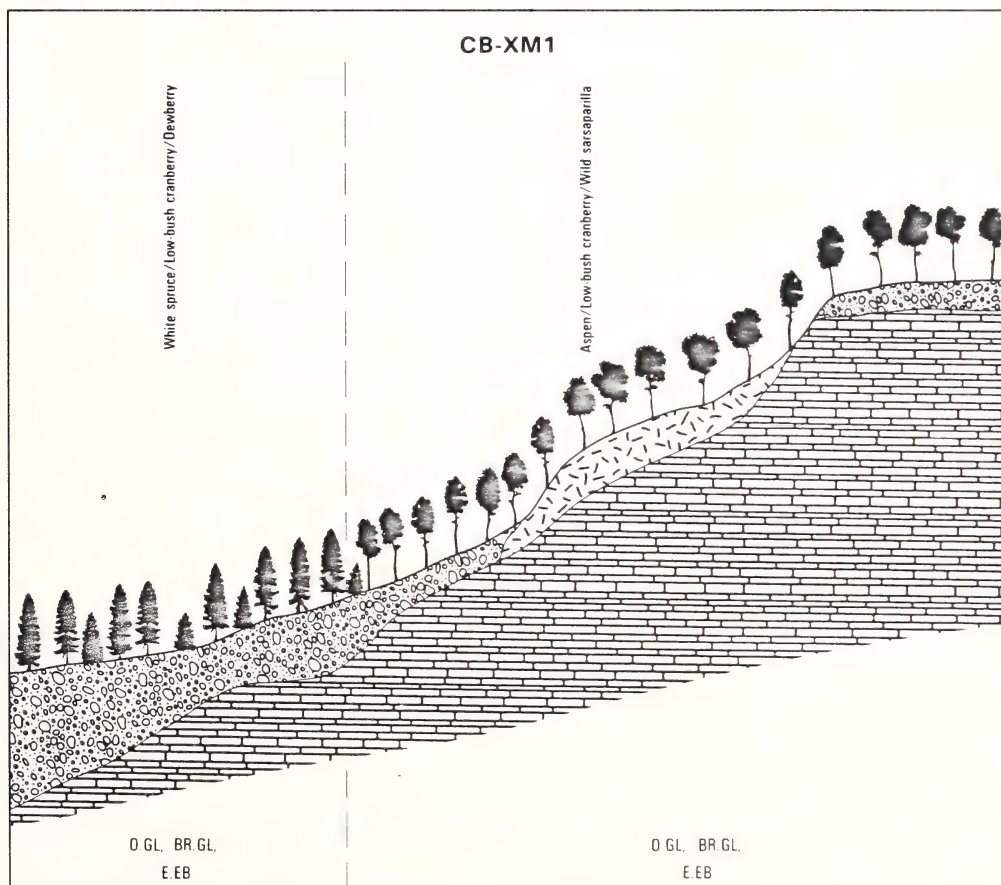


Figure 64: Schematic Diagram of Ecosection CB-XM1

2.2.2 Cutbank Plateau Subregion (Ecodistrict)

This subregion is centered around the headwaters of the Cutbank River north of the Kakwa River valley (Figure 65). The topography varies from gently undulating plateau remnants to the highly dissected side slopes of tributary stream valleys of the Kakwa and Cutbank Rivers. Relief is variable across this subregion ranging from 170 m in the east to 520 m in the west around Nose Mountain. The subregion lies within several ecoregions, namely the Boreal Uplands, Boreal Foothills and Subalpine, depending on elevation.

The subregion is underlain by gently dipping bedrock of the Paskapoo Formation with strata of the Scollard Member being prominent at elevations between 975 m and 1 160 m. This bedrock is extremely prone to slumping and mass wasting. The bedrock in the area is covered by a variable thickness of Continental till with minor occurrences of Cordilleran till in the vicinity of Nose Mountain.

Moraine complexed with residual material dominate the surficial deposits in the landscape. These deposits support predominantly lodgepole pine forest with black spruce as a common component. With elevation changes across the subregion, vegetation progresses from aspen/ lodgepole forest on lower elevations to Engelmann x white spruce at higher elevations.

Colluvium deposits are found on dissected side slopes and are generally derived from moraine and residual materials. Seepage is very common hence vegetation often reflects patterns of groundwater movement,

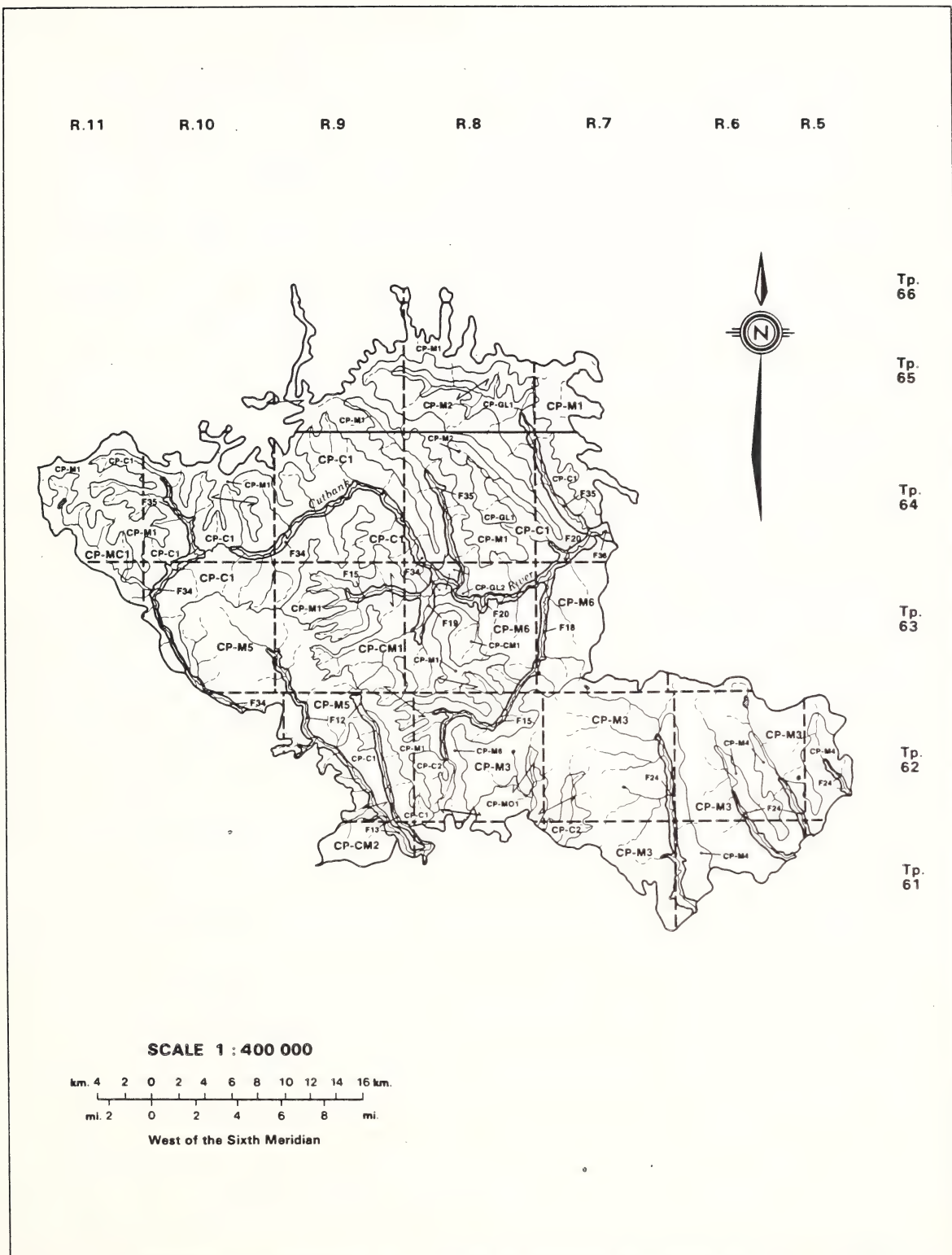


Figure 65: Cutbank Plateau Subregion (CP)

with white spruce in seepage tracks and black spruce and dwarf birch in groundwater discharge areas.

The Cutbank Plateau subregion is divided into fourteen systems/ecosections (Table 15). More detailed descriptions with accompanying schematic diagrams follow the table. Fluvial systems which cross the subregion are discussed in Volume I, Section 2.5 of the report.

There were nine fluvial systems identified (F12, F13, F15, F18, F19, F20, F24, F34, F35).

Table 15

SUMMARY OF ECOSECTIONS IN THE CUTBANK PLATEAU SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
CP-C1	Steep, highly dissected valley walls	Moderately fine-textured colluvium	White spruce, lodgepole pine and black spruce-pine forest
CP-C2	Undulating headwater valleys	Moderately fine-textured colluvium and continental till	Lodgepole pine and white spruce forest
CP-CM1	Steep-sided headwater valleys	Thin medium-textured till and colluvium	Lodgepole pine and aspen forest
CP-CM2	Steeply sloping valley walls	Thin medium-textured colluvium and thick continental till	Lodgepole pine and black spruce-pine forest
CP-GL1	Level, eroded terraces	Glaciolacustrine clay and peat	Lodgepole pine-black spruce and white spruce forest, muskeg
CP-GL2	Lacustrine terraces	Peat over glaciolacustrine silt and clay	Black spruce forest and muskeg
CP-M1	Gently undulating plateau	Moderately fine-textured till and residual materials	Lodgepole pine, Engelmann spruce-Subalpine fir forest
CP-M2	Gently side slopes	Moderately fine-textured and peat	Lodgepole pine and black spruce-pine forest, deciduous shrubland
CP-M3	Gently rolling ridges	Medium-moderately fine-textured till and peat	Lodgepole pine, black spruce-pine and black spruce forest, muskeg
CP-M4	Rolling ridges and side slopes	Moderately fine-textured till	Lodgepole pine, black spruce-pine and aspen forest
CP-M5	Moderately sloping basin	Moderately fine-textured till with sandy overlays	Lodgepole pine forest, deciduous shrubland and grassland
CP-M6	Gentle to steep ridges	Medium-textured till and colluvium	Lodgepole pine, black spruce-pine, white spruce and aspen forest
CP-MC1	Gentle to steep-sided headwater valleys	Moderately fine-textured till and colluvium, and peat	Lodgepole pine and Engelmann spruce-subalpine fir forest, dwarf birch shrublands
CP-MO1	Gently sloping ridges and lower slopes	Medium-textured till and peat	Lodgepole pine and black spruce-pine forest, muskeg

Physical Conditions:

Surficial deposits along this portion of the moderately to steeply sloping walls of the Cutbank River valley consist of colluvium, which is a mixture of weathered residual material and continental till (Figure 66). Till has been eroded from adjacent upland areas.

The valley walls of this system are extremely prone to slumping. The high incidence of slumping is the result of the presence of highly erodable shales of the Scollard Member of the Paskapoo formation. The presence of the Scollard member combined with north-dipping bedrock strata leads to pronounced groundwater discharge on northern exposures.

Materials	Texture	Slope	Drainage	Soils	Plant Association
<u>Cvb</u> <u>R</u>	SiCL-SCL	31-70	1-3	O.R, O.DYB	Lodgepole pine/Hairy wild rye Lodgepole pine/Alder/Dewberry White spruce/Feathermoss Aspen/Buffaloberry/Aster
		15-30	2-3	O.DYB, E.DYB	Lodgepole pine/Alder/Dewberry/ Lodgepole pine/Labrador tea- Tall bilberry White spruce/Feathermoss
		0-15	4	GL.DYB, GL.BRGL, Gleysols	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry Black spruce/Horsetail/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

Aspect and groundwater seepage have significant influences on the vegetation pattern. Lodgepole pine and aspen forest is found on southern exposures, with aspen especially common where slumping has occurred. Northern exposures support a mixture of lodgepole pine and white spruce forest, white spruce predominating on slopes receiving seepage water. White and black spruce forest occurs in groundwater discharge areas on lower slopes.

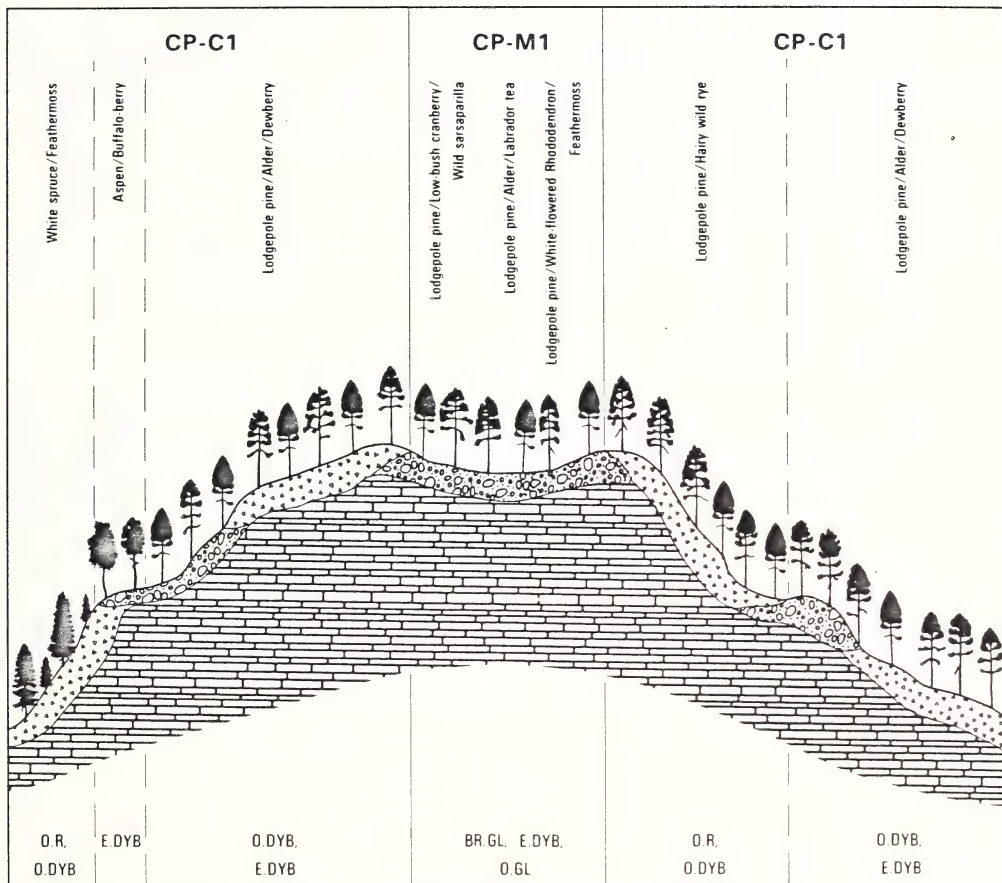


Figure 66: Schematic Diagram of Ecosystems CP-C1 and CP-M1

Physical Conditions:

This complex system includes portions of the inclined to undulating upper headwater valley walls of Boulder and Route Creeks and several other unnamed tributaries of the Kakwa River (Figure 67). Thin colluvial veneers are the principal surficial materials. These colluvial veneers are derived from eroded till deposits and residual sandstone materials. Till deposits of Continental origin occur on lower slope positions and are commonly overlain by a combination of either colluvial materials, thin fluvial veneers derived from slope wash or thin glaciofluvial materials.

Materials	Texture	Slope	Drainage	Soils	Plant Association
$\frac{Cvb}{R}$	KL-SL	15-45	2-3	E.DYB, BR.GL	Lodgepole pine/Alder/Dewberry Lodgepole pine/Hairy wild rye White spruce/Feathermoss
$\frac{Mvb}{R}$	SiL-SiCL	2-15	2-4	O.GL, BR.GL, GL.GL	Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/Alder/Dewberry Black spruce/Horsetail/Sphagnum
$\frac{GFvb}{M}$	gSL-KL	2-9	2-3	BR.GL	Lodgepole pine/Labrador tea/Tall bilberry

Ecoregion: Boreal Uplands

Ecological Conditions

Overstory composition reflects the increased availability of soil moisture on lower slope positions, with lodgepole pine forest on upper slopes, and white and black spruce forest on lower slopes. Open black spruce forest and shrubland occurs sporadically in groundwater discharge areas.

Aspect has an influence on the understory of pine forests, with those on southern exposures having a sparse grassy understory.

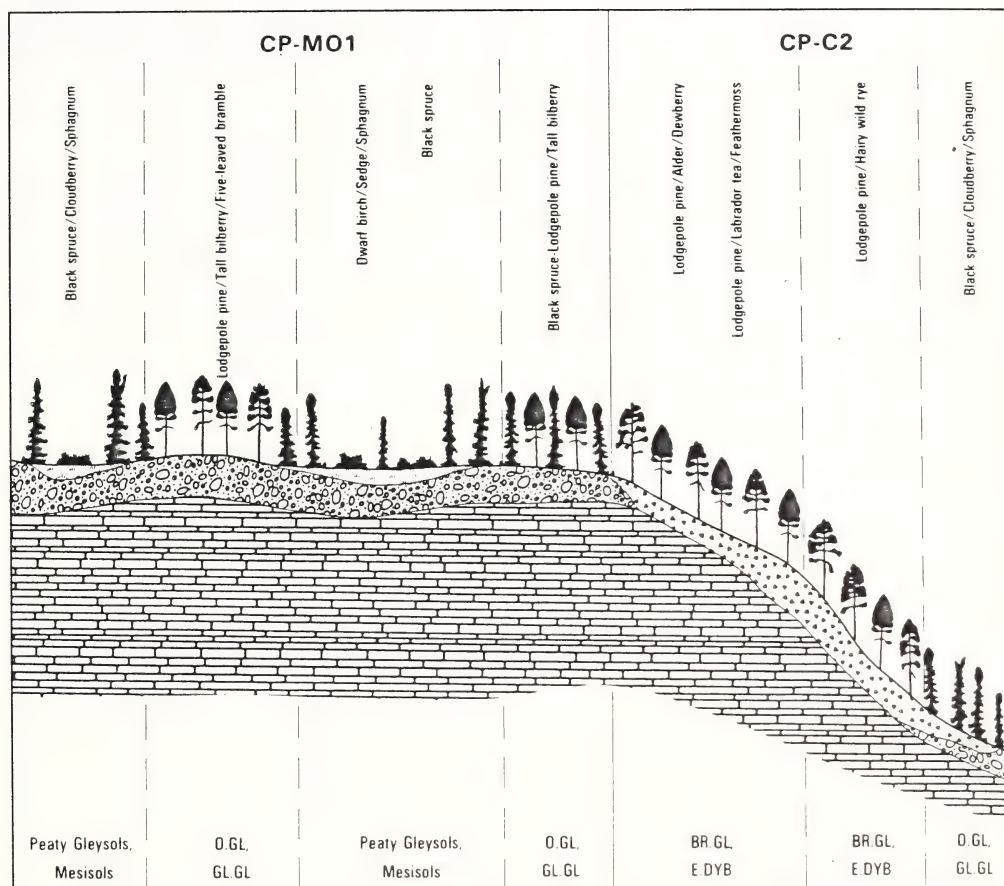


Figure 67: Schematic Diagram of Ecosections CP-C2 and CP-MO1

Physical Conditions:

The highly dissected, steeply sloping headwater valleys of Wolf and North Wolf Creeks have a complex of thin colluvial veneers overlying bedrock on upper slope positions and relatively thick till deposits of Continental origin on lower slopes (Figure 68). Colluvial veneers which account for approximately 60% of all surficial materials are derived from eroded tills and residual sandstone materials. Pronounced headwater erosion has resulted in oversteepened valley walls that are prone to mass wasting and slumping.

Materials	Texture	Slope	Drainage	Soils	Plant Association
$\frac{Cv}{R}$	SiCL-kL	31-70	2-3	O.R, E.EB	Lodgepole pine/Hairy wild rye Lodgepole pine/Alder/Dewberry Aspen/Bufalo-berry/Showy aster
$\frac{Mvb}{R}$	SiCL	6-30	2-3	O.GL, BR.GL	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Lodgepole pine/Alder/Dewberry Lodgepole pine/Labrador tea/ Feathermoss

Ecoregion: Boreal Foothills
Boreal Uplands

Ecological Conditions

Topography and elevation influence vegetation composition within these valleys. At lower elevations, lodgepole pine forest is found on gentle slopes while surficial materials are thick, and aspen forest occurs on steeper areas. Deciduous shrubland and balsam poplar groves are found in groundwater discharge areas. Lodgepole pine forest predominates at higher elevations, where small stands of aspen are confined to steep southern exposures.

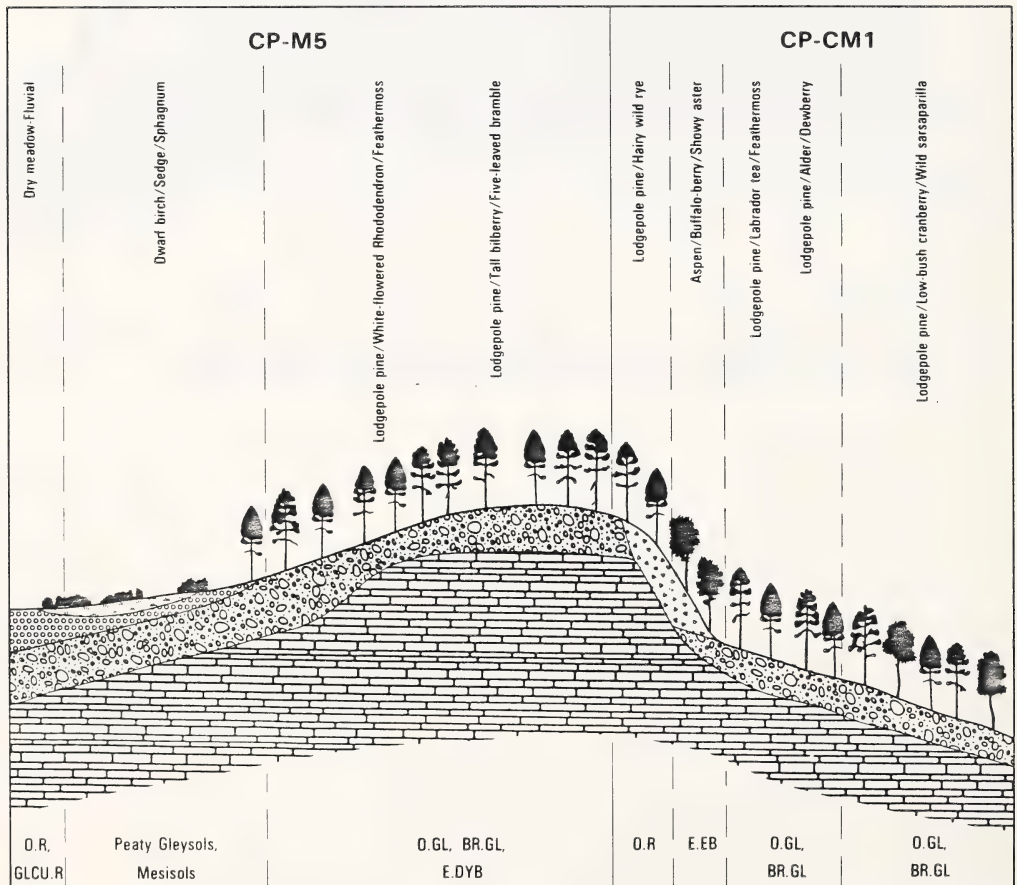


Figure 68: Schematic Diagram of Ecosystems CP-M5 and CP-CM1

Physical Conditions:

This system occurs northwest of the confluence of Redrock Creek and the Kakwa River and is characterized by massive bedrock slumps (Figure 69) that have occurred along seams of coal or bentonitic shales. Surficial materials consist of thin colluvial veneers and thick till deposits of Continental origin. Colluvial materials were derived from eroded till deposits and locally weathered sandstone materials. Surface expression varies from inclined to ridged with slopes ranging from moderate to very strong.

Materials	Texture	Slope	Drainage	Soils	Plant Association
$\frac{Mvb}{R}$	KL	10-30	2-3	O.GL, BR.GL	Lodgepole pine/Tall bilberry/Five-leaved bramble Lodgepole pine/Labrador tea/Tall bilberry, Black spruce-Lodgepole pine/Labrador tea-Tall bilberry
$\frac{Cvb}{R}$	SL	10-30	2-3 4-5	O.R, O.EB GLBR.GL, Gleysols	Lodgepole pine/Alder/Dewberry Black spruce/Horsetail/Sphagnum

Ecoregion: Subalpine
Boreal Uplands

Ecological Conditions

Differences in the moisture regimes of parent materials create the vegetation pattern. Lodgepole pine and black spruce-pine forest are found on inclined till deposits at high elevations. Pronounced movement of groundwater through colluvial materials at lower elevation is reflected in the pattern of open black spruce muskeg in seepage tracks and lodgepole pine forest with a dense alder understory on elevated sites. Excessive soil moisture levels have slowed forest succession on recently burned areas on lower slopes.

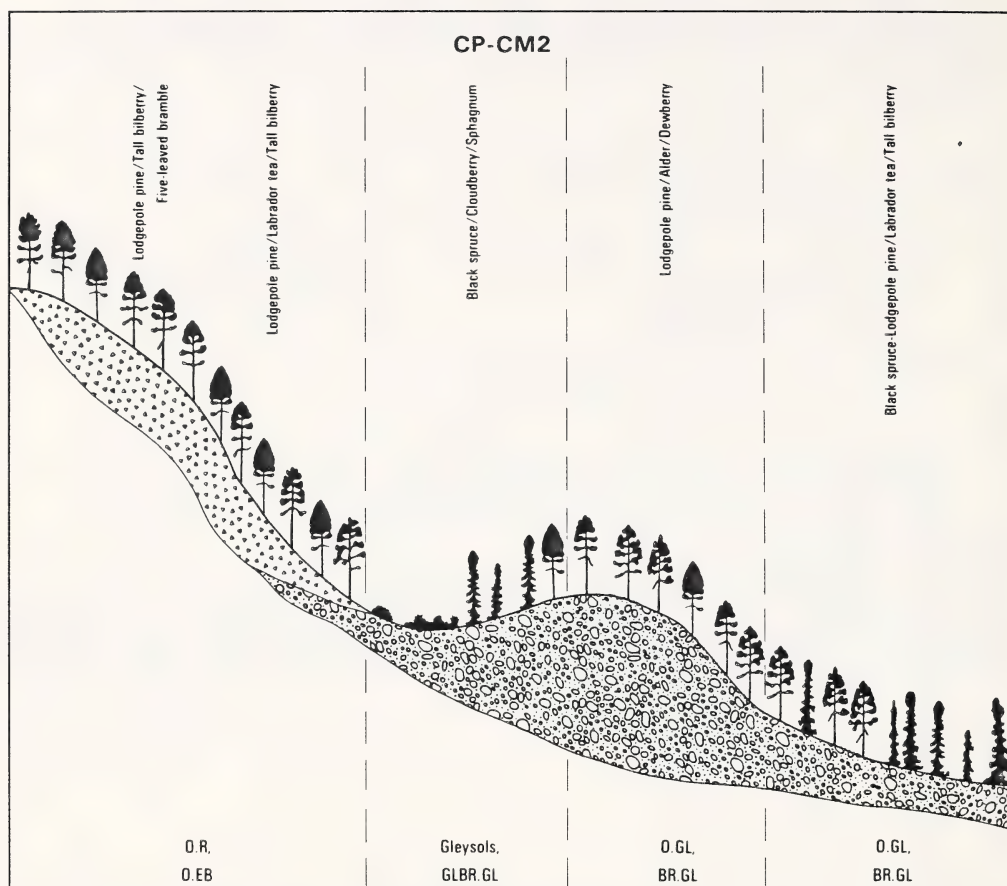


Figure 69: Schematic Diagram of Ecosection CP-CM2

Physical Conditions:

This system consists of level to very gently sloping, eroded glaciolacustrine terraces (Figure 70) bordering tributary streams north of the Cutbank River. These moderately fine to fine textured glaciolacustrine sediments are of variable thickness and are the result of sediments being settled out of a short-lived, ice dammed lake. These glaciolacustrine sediments are overlain by either thick accumulations of sphagnum peat or thin glaciofluvial and fluvial veneers derived from slope wash. The entire system is underlain by moderately fine-textured Continental tills, which combined with seepage from adjacent areas, causes poor drainage conditions throughout.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GL	SiCL-CL	0-2	4-5	GL.GL, Gleysols	Lodgepole pine/Black spruce/ Labrador tea/Feathermoss White spruce/Common horsetail
$\frac{GFv}{M}$	$\frac{SiCL}{gCL}$	0-5	3-4	O.GL, GL.GL	Lodgepole pine/Black spruce/ Labrador tea/Feathermoss
$\frac{Ovb}{GL}$	$\frac{Mesic}{CL}$	0-2	5-6	Peaty Gley- sols, Mesi- sols	Black spruce/Feathermoss/ Tamarack-Black spruce/Dwarf birch/ Sphagnum

Ecoregion: Boreal Foothills

Ecological Conditions

The vegetation changes from black spruce-lodgepole pine forest to black spruce forest and muskeg as soil moisture increases closer to tributary streams.

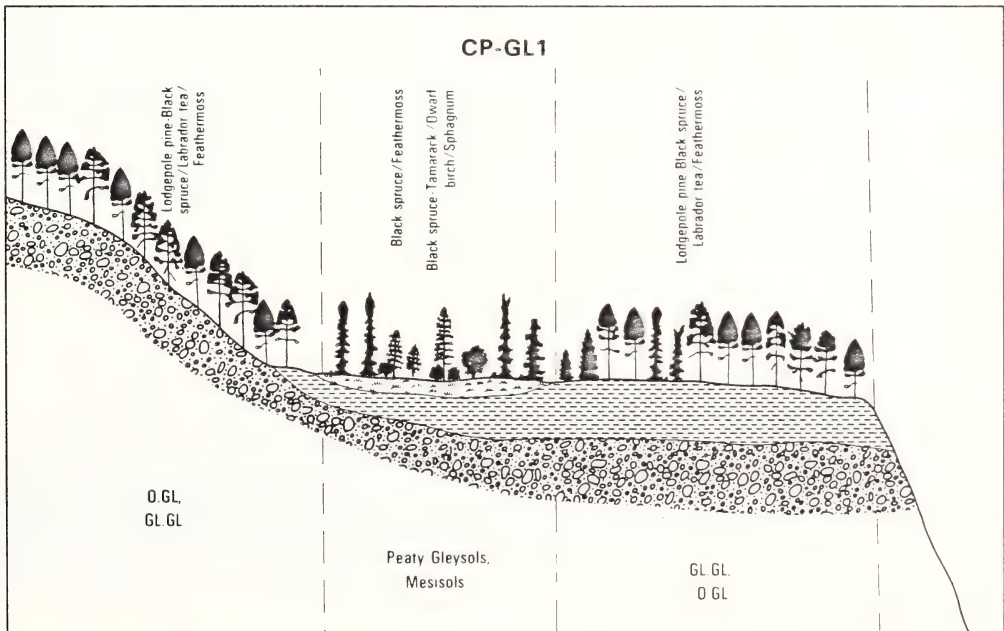


Figure 70: Schematic Diagram of Ecosection CP-GL1

Physical Conditions:

Several small, poorly to very poorly drained glaciolacustrine terraces make up this system (Figure 71) which occurs adjacent to the confluence of Wolf Creek and the Cutbank River. These moderately fine to fine-textured glaciolacustrine sediments have settled out of a short lived ice dammed lake that occupied portions of the Cutbank River and Wolf Creek valleys. These deposits are overlain by thin accumulations of sphagnum peat and are underlain in turn by Continental tills.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Ov GL	Mesic STCL	0-2	5-6	Gleysols, Mesisols	Black spruce/Feathermoss Tamarack-Black spruce/Dwarf birch/ Sphagnum

Ecoregion: Boreal Foothills

Ecological Conditions

Closed black spruce forests and open muskeg characterize this poorly drained landscape.

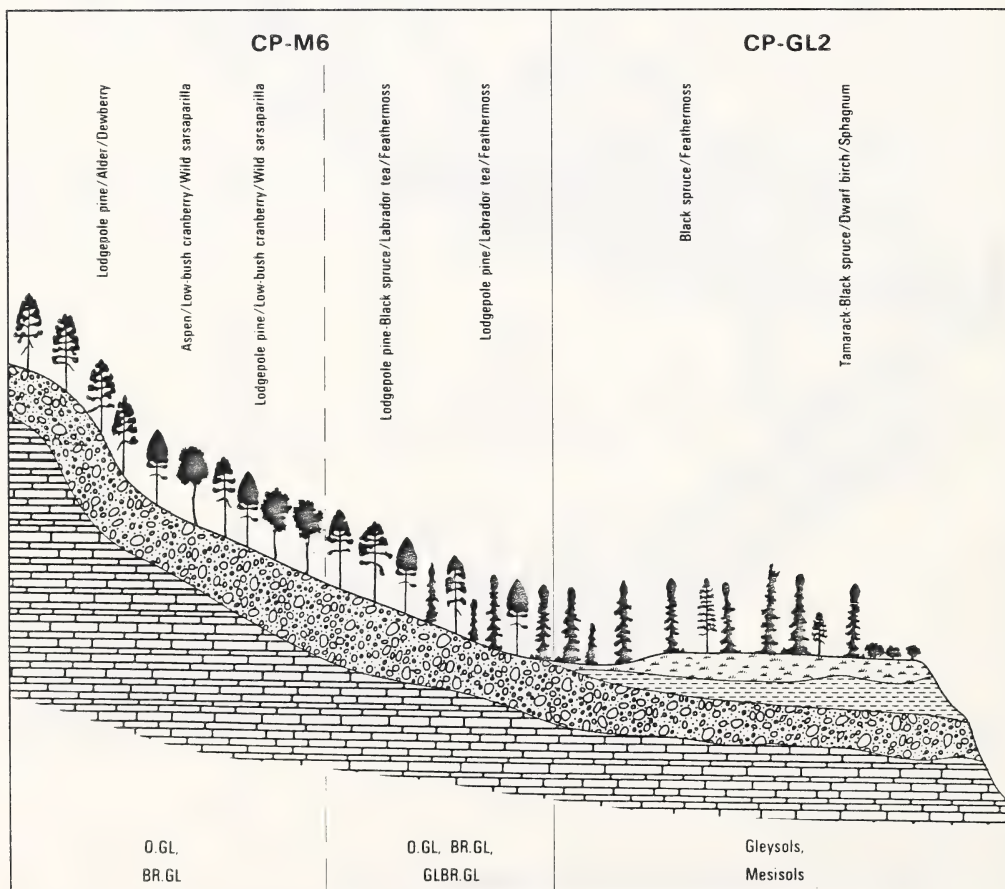


Figure 71: Schematic Diagram of Ecosections CP-GL2 and CP-M6

Physical Conditions

This is a narrow, gently undulating to rolling plateau remnant that divides the Cutbank River from the Wapiti River drainage system (Figure 72). Side slopes (CP-C1, CB-M1) have been highly dissected by tributaries of these rivers. Till deposits of Cordilleran (in the west) and continental (in the east) origin thinly mask the bedrock, and decrease in thickness toward the west where residual materials are often exposed.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mb}{R}$	SiCL	0-5	2-4	O.GL, BR.GL, GL.GL	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Lodgepole pine/Alder/Labrador tea
$\frac{Mv}{X}$	$\frac{SiCL}{SCL}$	0-5	2-3	BR.GL, E.DYB	Lodgepole pine/Alder/Labrador tea Lodgepole pine/Labrador tea-Tall bilberry Lodgepole pine/White-flowered rhododendron/Feathermoss
$\frac{Xv}{R}$	SCL	3-6	2-3	BR.GL, E.DYB	Lodgepole pine/White-flowered rhododendron/Feathermoss Lodgepole pine/Tall bilberry/Five- leaved bramble Engelmann spruce-Subalpine fir/ White-flowered rhododendron/ Feathermoss

Ecoregion: Boreal Foothills
Boreal Uplands
Subalpine

Ecological Conditions

Lodgepole pine forest covers this plateau, with local variation in tree species composition caused by gradual changes in climate as elevation increases. Aspen is a common component of the tree canopy at lower elevations, while at higher elevations Engelmann spruce and subalpine fir are mixed with pine.

Variation in the thickness of till deposits has an influence on understory composition. Alder is extremely common where till deposits are thin, probably because low permeability of the underlying bedrock traps water near the surface.

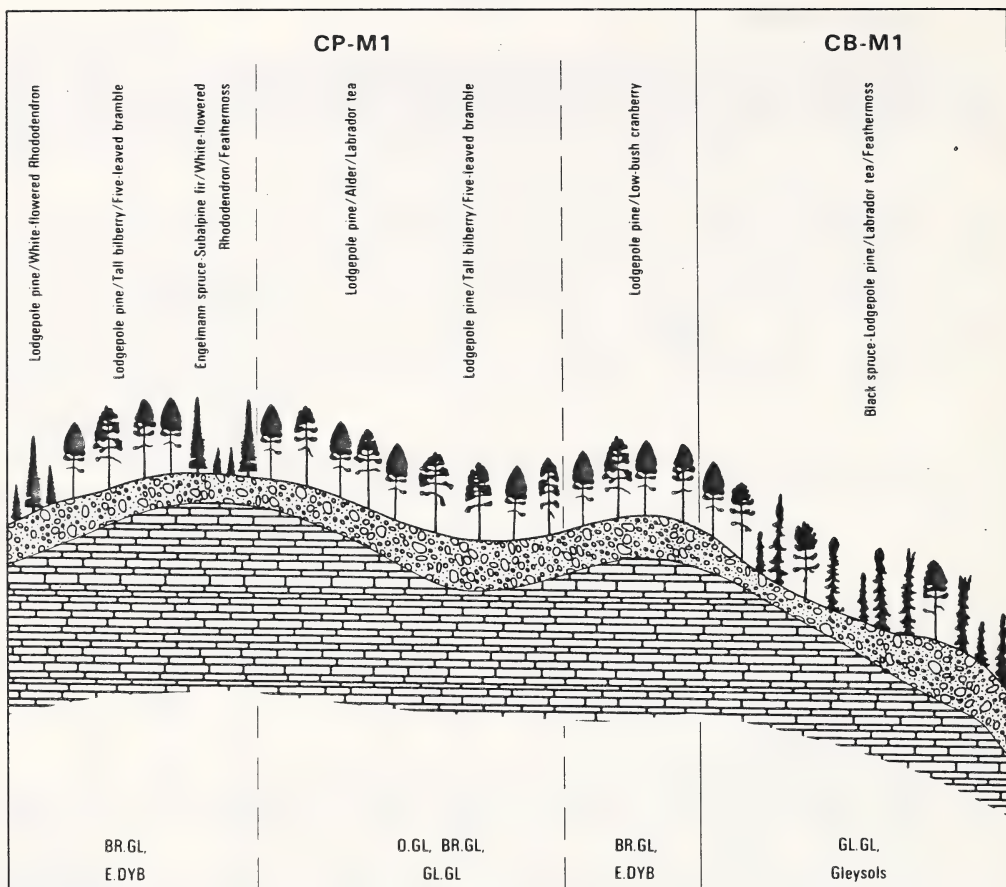


Figure 72: Schematic Diagram of Ecosystems CP-M1 and CB-M1

Physical Conditions:

This basin-like system, north of the Cutbank River, consists of gently undulating to rolling till deposits of Continental origin (Figure 73). Extensive headwater erosion of the Cutbank Plateau by an unnamed tributary stream of the Cutbank River has resulted in the formation of this basin. Thick, moderately well to imperfectly drained, moderately fine-textured till deposits occur across much of the system and seepage is common. Small accumulations of sphagnum peat develop where rotational slumps have occurred.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	SiCL	5-15	3	0.GL, BR.GL	Lodgepole pine/Alder/Dewberry
		2-5	3-4	0.GL, BR.GL, GL.GL, GLBR.GL	Lodgepole pine/Alder/Labrador tea Lodgepole pine/Labrador tea/ Feathermoss Black spruce-Lodgepole pine/ Labrador tea/Tall bilberry
$\frac{Ovb}{M}$	Mesic STCL	0-2	5-6	Peaty Gleysols, Mesisols	Dwarf birch/Sedge/Sphagnum Black spruce/Horsetail/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

The vegetation pattern reflects local variation in drainage conditions on this irregular topography. Lodgepole pine forest covers most of the landscape, grading into black spruce-lodgepole pine forest along the numerous seepage tracks in this ecosection. The small patches of level terrain, produced by slumping, support open black spruce forest and shrubby muskeg.

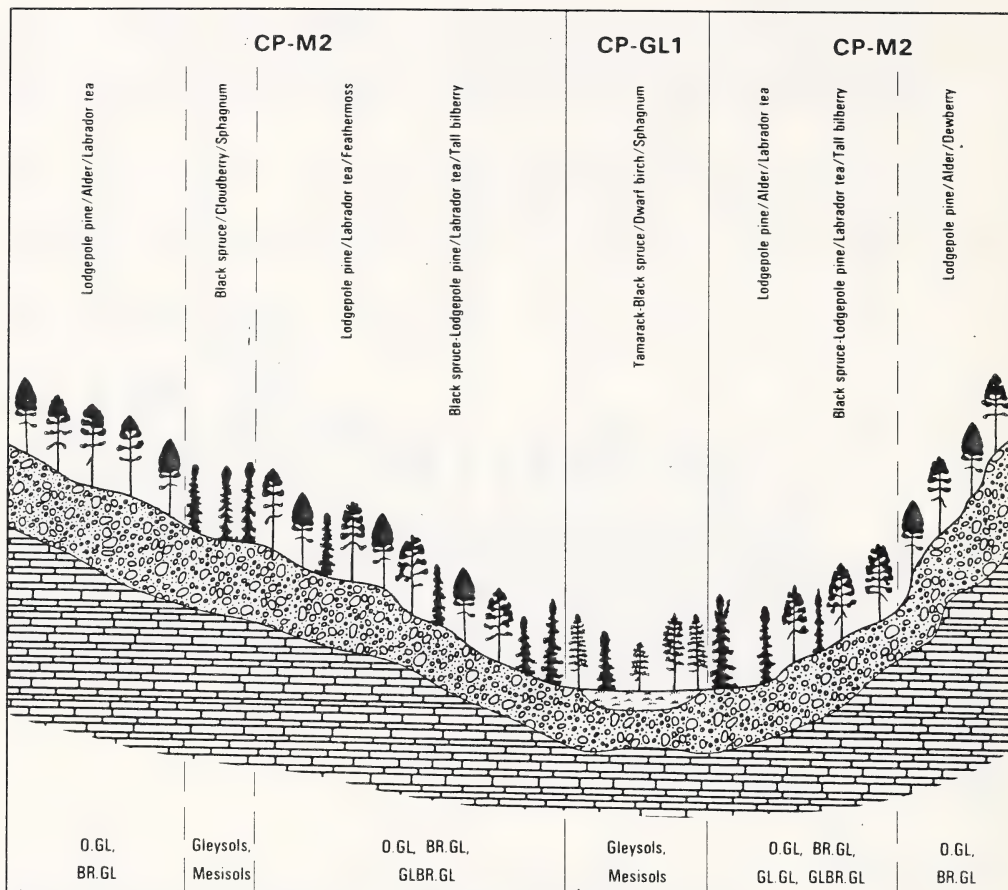


Figure 73: Schematic Diagram of Ecosections CP-M2 and CP-GL1

Physical Conditions:

This system which occurs on the north side of the Kakwa River consists of a series of gently sloping, south-trending ridges which are separated by several tributary valleys (Figure 74). Surficial materials consists primarily of medium to moderately-fine textured Continental tills overlying bedrock. Residual sandstone materials are common on steeper terrain where till deposits are either thin or absent. Numerous small accumulations of sphagnum peat have developed locally where drainage is impeded.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb.}{R}$, $\frac{Xvb.}{R}$	S1L-S1CL	2-10	2-4	O.GL, BR.GL, E.DYB, GLBR.GL	Lodgepole pine/Labrador tea/ Feathermoss Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry Lodgepole pine/Alder/Dewberry
$\frac{Ovb.}{M}$	Mesic S1CL	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Horsetail/Sphagnum Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

Differences in the depth of surficial materials and local variation in drainage produces the vegetation pattern in this ecosystem. Most of the landscape is covered by coniferous forest that grades from lodgepole pine to black spruce-lodgepole pine as soil moisture increases. Till deposits appear to become thinner close to the Kakwa River, and the pattern changes to one with pine forest on elevated sites and a mixture of black spruce forest and deciduous shrubland in low-lying areas between subdued ridges.

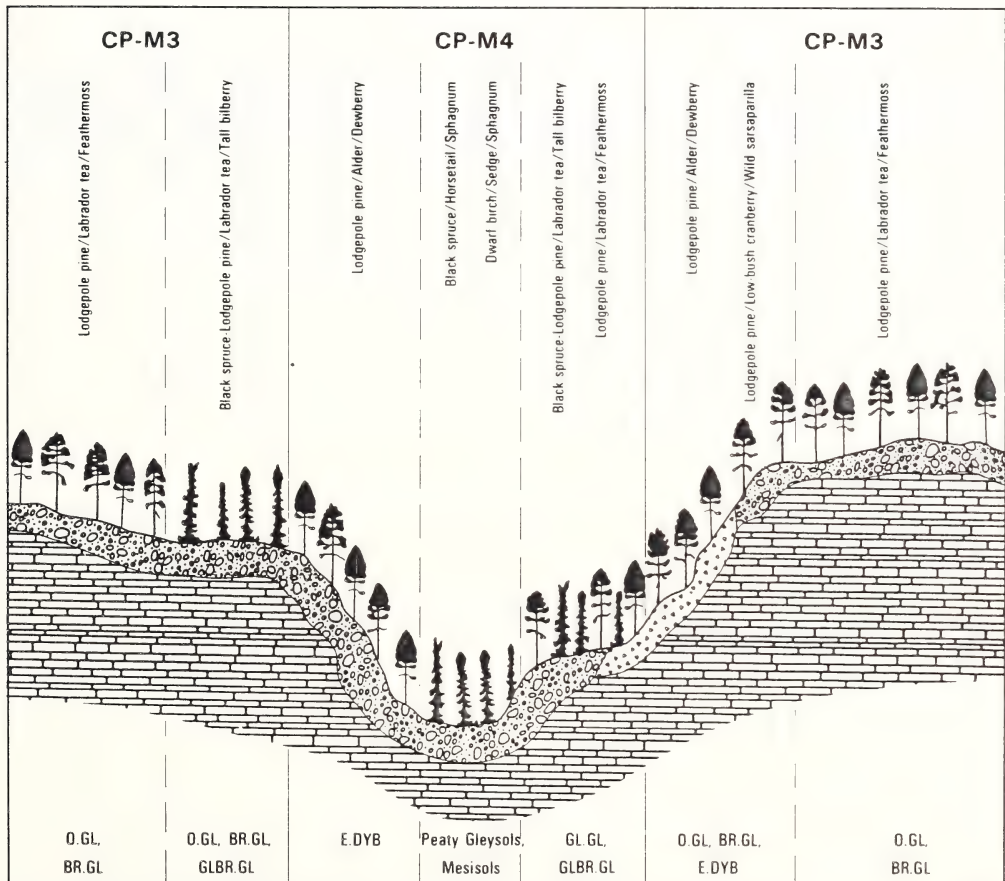


Figure 74: Schematic Diagram of Ecosystems CP-M3 and CP-M4

Physical Conditions:

Continental till is the dominant surficial material on these steeply sloping eroded valley walls of tributaries to the Kakwa River (Figure 74). The till varies in thickness and often contains significant amounts of weathered bedrock on steep terrain. Groundwater seepage is very apparent along most slopes where bedrock is near the surface.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb/Xv}{R}$	SiCL-SiL	15-45	2-3	O.GL, BR.GL, E.DYB	Lodgepole pine/Alder/Dewberry Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Aspen/Low-bush cranberry/Dewberry
			4	GL.GL, GLBR.GL	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry
$\frac{Ov}{M}$	$\frac{Mesic}{SiCL}$	0-2	5-6	Peaty Gley- sols, Mesi- sols	Black spruce/Horsetail/Sphagnum Dwarf birch/sedge Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

Exposure, groundwater seepage and variation in the depth of surficial materials, creates a heterogeneous vegetation pattern. Open black spruce forest, deciduous shrublands and black spruce-lodgepole pine forest are found on northern and eastern exposures fed with seepage water, while lodgepole pine forest is found on these slopes where seepage is not a factor. Thin surficial deposits on steep southern exposures close to the Kakwa River support aspen forest.

Physical Conditions:

Centered around the headwaters of Redrock Creek, this large catchment basin consists of a complex of thin Continental till, fluvial (slope wash) veneers and, to a lesser extent, thin organic deposits underlain by nearly level to gently sloping bedrock (Figure 68). Residual sandstone materials are commonly exposed on upper slopes where till has been eroded away. Although surficial materials are coarse-textured, pronounced movement of groundwater creates conditions of high moisture availability on lower slopes.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}, \frac{Xv}{R}$	SiCL-KL	2-15	2-3	O.GL, BR.GL, E.DYB	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Tall bilberry/ Five-leaved bramble
$\frac{Fv}{M}$	$\frac{S-SiCL}{KL}$		2-4	O.R, GLCU.R	Dry meadow-fluvial
$\frac{Ov}{M}$	$\frac{Mesic}{KL}$	0-2	4-5	GL.R, GLCU.R, Gleysols	Dwarf birch/Sedge Sphagnum

Ecoregion: Subalpine

Ecological Conditions

The occurrence of coarse-textured veneers on slopes receiving seepage water creates an unusual mosaic of open habitats on this landscape. Deciduous shrubland is formed in poorly drained subdued valleys, while the ridges between valleys present a dry environment that supports grasslands of variable composition. Lodgepole pine forest is found on the surrounding well-drained uplands.

Physical Conditions:

Found along the north-facing slopes of the Cutbank River, this system is characterized by very gently to strongly sloping bedrock ridges separated by Boulder Creek (Figure 71). Surficial materials consist primarily of inclined to gently rolling deposits of Continental till and residual sandstone materials. Till deposits are of variable thickness and are comprised of medium to moderately-fine textured materials. Oversteepening of slopes by headwater erosion has led to local slumping and gullying. This has resulted in small areas of colluvial veneers overlying bedrock.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb, Xvb}{R \quad R}$	SiL-SiCL	2-30	2-3	O.GL, BR.GL	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/Alder/Dewberry
		2-9	3-4	O.GL, BR.GL, GLBR.GL	Lodgepole pine-Black spruce/ Labrador tea/Feathermoss White spruce/Low-bush cranberry/ Dewberry
$\frac{Cv}{R}$	L	16-30	2-3	BR.GL	Lodgepole pine/Alder/Dewberry Aspen/Low-bush cranberry/Dewberry White spruce/Low-bush cranberry/ Dewberry

Ecoregion:- Boreal Foothills
Boreal Uplands

Ecological Conditions

Lodgepole pine forest predominates on these relatively cool northern exposures. Black spruce and white spruce forest is found on the lower slopes of tributary valleys where surficial materials are thicker and the soil moisture regime more favorable. Aspen forest is confined to steep upper slopes and is not common.

Physical Conditions:

The gently to very strongly sloping headwater valley walls of the North Cutbank River make up this system (Figure 75). In the upper reaches of this system, centered around Nose Lake, gently to moderately sloping bedrock is overlain by thin till deposits of Cordilleran origin. On lower slope positions, these moderately fine-textured till deposits are overlain by fluvial veneers of variable thicknesses derived from slope wash. In the southern portions, moderately to very strongly sloping bedrock is overlain by a combination of thin Cordilleran tills and colluvial materials derived from till and weathered bedrock. These steeper slopes are prone to slumping. Numerous fan-like deposits comprised of both fluvial and colluvial materials occur on lower slope positions throughout the system. Thick organic accumulations of sphagnum peat occur adjacent to the North Cutbank River and Nose Lake.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mv}{R}$	SiCL	6-15	2-3	BR.GL	Lodgepole pine/White-flowered rhododendron/Feathermoss Lodgepole pine/Tall bilberry/ Five-leaved bramble
$\frac{Cv}{R}$	SiCL-SCL	16-45	2-3	O.DYB, E.DYB, O.R	Engelmann X White spruce/ Feathermoss Lodgepole pine/Tall bilberry/ Five-leaved bramble Lodgepole pine/Hairy wild rye
$\frac{Ovb}{F}$	$\frac{Fibric}{SL}$	0-2	5-6	Fibrisols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

Till deposits on uplands support lodgepole pine forest, while colluvial deposits are characterized by a mixture of lodgepole pine and Engelmann spruce forest. The greater incidence of spruce on colluvium is probably a result of the greater thickness and more favorable moisture regime of these deposits. Dwarf birch shrubland is found on peat along valley bottoms.

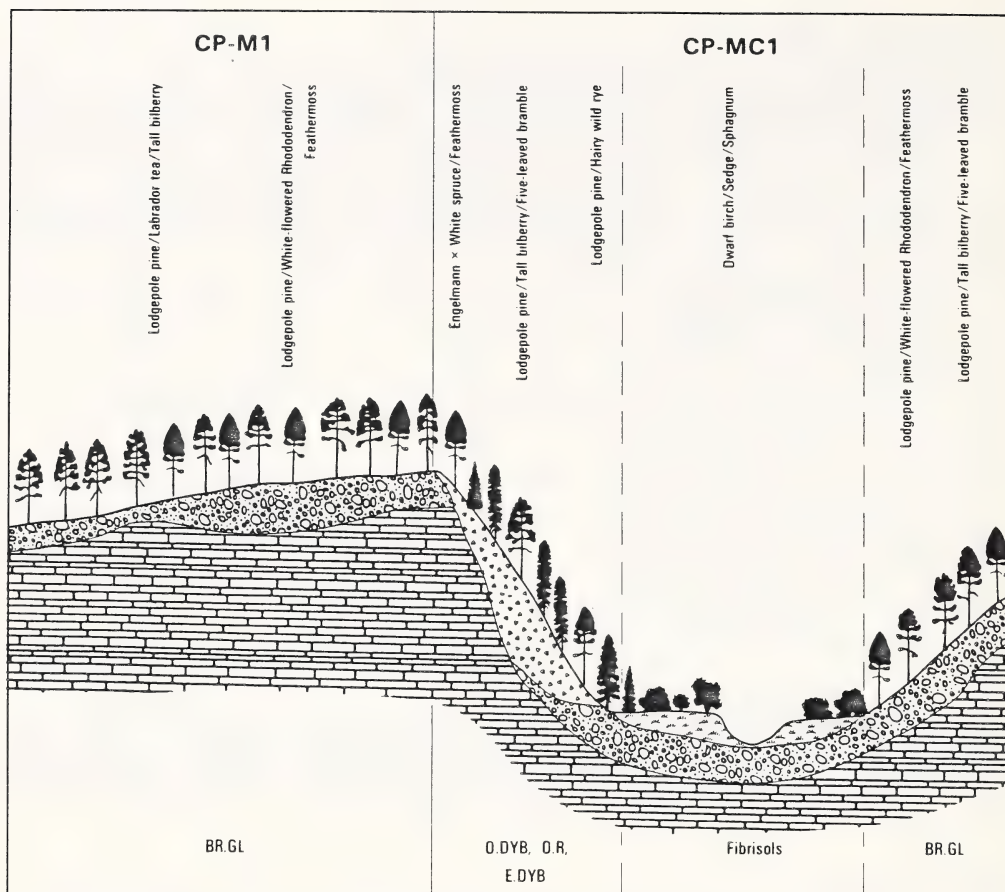


Figure 75: Schematic Diagram of Ecosystems CP-MC1 and CP-M1

CP-M01

Physical Conditions:

Located north of the Kakwa river and east of Route Creek, this system consists of a complex of Continental tills on upland sites with extensive organic accumulations in depressional terrain and valley bottoms (Figure 67). Medium to moderately fine-textured till deposits are of variable thickness and are often found in association with residual sandstone materials.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	SiCL-KL	2-9	2-4	0.GL, GL.GL	Lodgepole pine/Tall bilberry/Five-leaved bramble Black spruce-Lodgepole pine/Tall bilberry
$\frac{Ovb}{M}$	$\frac{Mesic}{SiCL}$	0-2	5-6	Peaty Gley-sols, Mesi-sols	Black spruce-Horsetail/Sphagnum Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

The occurrence of fairly extensive peat deposits supporting black spruce muskeg and deciduous shrublands on valley bottom distinguishes this ecosection from the surrounding landscape. Lodgepole pine forest typical of the region occurs on upland sites.

2.2.3 Deep Valley Plateau Subregion (Ecodistrict)

This level to undulating plateau which is located east of the Simonette River (Fig. 76) was not extensively altered by glaciation. It has a cap of highly cemented preglacial (tertiary) gravels which, combined with the slow permeability of the underlying Paskapoo bedrock, causes restricted drainage over most of the subregion. Elevations range from 1 150 m to 1 370 m and the subregion falls within the Boreal Uplands and Subalpine ecoregions.

Preglacial gravels and peat are the major surficial materials on the plateau, with stony colluvium and till in valleys of tributaries to the Simonette River, and outwash sand and gravel on the southern portion of the plateau.

The poorly drained portions of the plateau support a mixed muskeg of deciduous shrublands, sedge meadows and open black spruce and larch stands. Gravel ridges on the plateau support a mixed forest of black spruce and lodgepole pine, while lodgepole pine forest is found on valley slopes and white spruce on valley floors.

The Deep Valley Plateau subregion is divided into five systems/ecosections. Their characteristics are outlined briefly following Table 16. One fluvial system was identified within the subregion (F29). Its characteristics are discussed in Section 2.5, Volume I of the report.

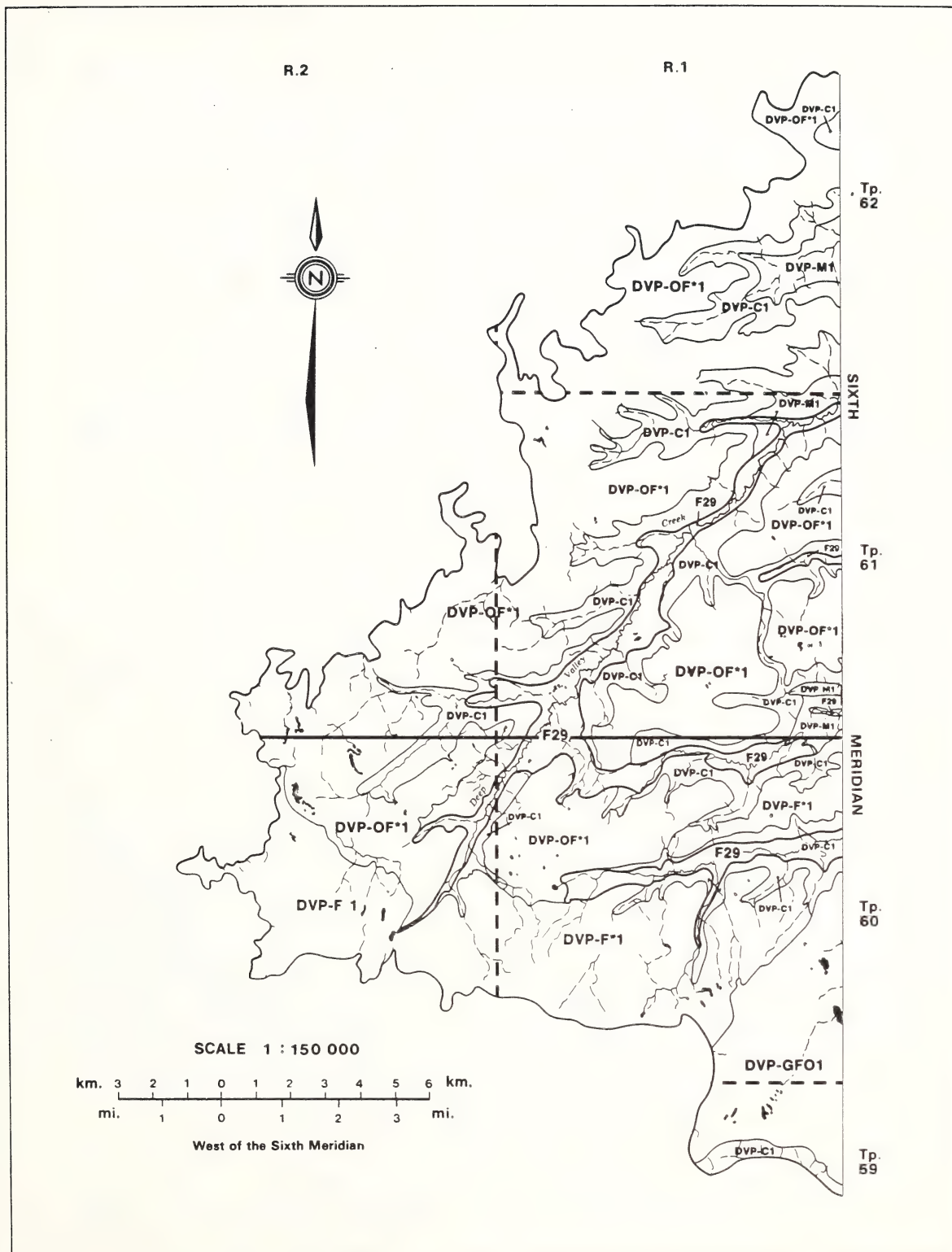


Figure 76: Deep Valley Plateau Subregion (DVP)

Table 16

SUMMARY OF ECOSECTIONS IN THE DEEP VALLEY PLATEAU SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
DVP-C1	Steep valley walls	Rubby colluvium	Lodgepole pine forest
DVP-F*1	Gently undulating plateau	Preglacial outwash gravels	Lodgepole pine-black spruce forest and dwarf shrublands
DVP-GF01	Outwash plain	Outwash gravels and peat	Lodgepole pine and black spruce-pine forest, muskeg
DVP-M1	Undulating valley bottoms	Medium-textured till with sandy overlays	Lodgepole pine and white spruce forest
DVP-OF*1	Gently undulating plateau	Peat and preglacial outwash gravels	Muskeg, black spruce, lodgepole pine forest

Physical Conditions:

This system consists of the moderate to steep sloping valley walls of the small streams which flow across the subregion (Figure 77). Along these narrow valley walls the dominant deposits consist of colluvial veneers overlying bedrock. Much of the material is a matrix of preglacial gravels, till and unconsolidated bedrock rubble. Large areas of these valley walls show evidence of gullying and minor slumping.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cv}{R}$	gSL	10-45	1-3	O.R., E.EB, BR.GL	Lodgepole pine/Alder/Dewberry Lodgepole pine/Hairy wild rye White spruce/Feathermoss

Ecoregion: Boreal Uplands

Ecological Conditions

Exposure has a significant effect on forest composition within these valleys. Southern exposures are characterized by lodgepole pine forest with a grassy understory, while a mixture of lodgepole pine and white spruce forest with a richer understory is found on northern exposures.

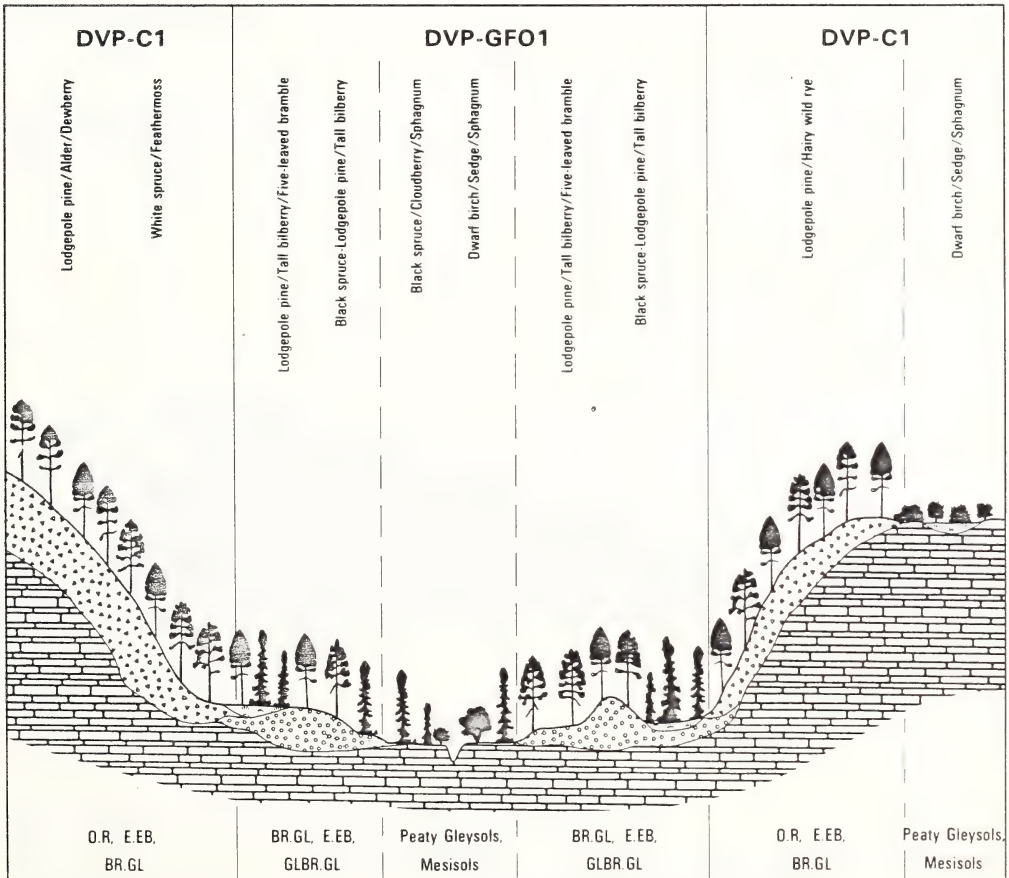


Figure 77: Schematic Diagram of Ecosections DVP-C1 and DVP-GF01

Physical Conditions:

This system occupies the southern portion of the plateau (Figure 78). Strongly cemented pre-glacial gravels are the dominant surficial materials and are occasionally overlain by thin till deposits of Continental origin. These till deposits were pushed up by glacial ice sheets that occupied adjacent valley positions. Peat-filled glacial meltwater channels are common across the landscape. Imperfect to poorly drained conditions predominate over most of this area.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
F*	kSL	2-9	4-5	GLBR.GL, Gleysols	Black spruce-Lodgepole pine/Tall bilberry
Mv F*	SiL KSL	2-9	2-4	BR.GL, PZ.GL, GLBR.GL	Lodgepole pine/Tall bilberry/Five- leaved bramble Lodgepole pine/White-flowered rhododendron Black spruce-Lodgepole pine/Tall bilberry
Ov F*	Mesic KSL	0-2	6	Mesisols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

High soil moisture, due to the impermeability of underlying materials causes black spruce-lodgepole pine forest to predominate on this portion of the plateau. More mesic lodgepole pine forest is confined to elevated ridges of till and is not extensive. Dwarf birch shrublands are found on the floors of glacial meltwater channels where soil moisture is excessive.

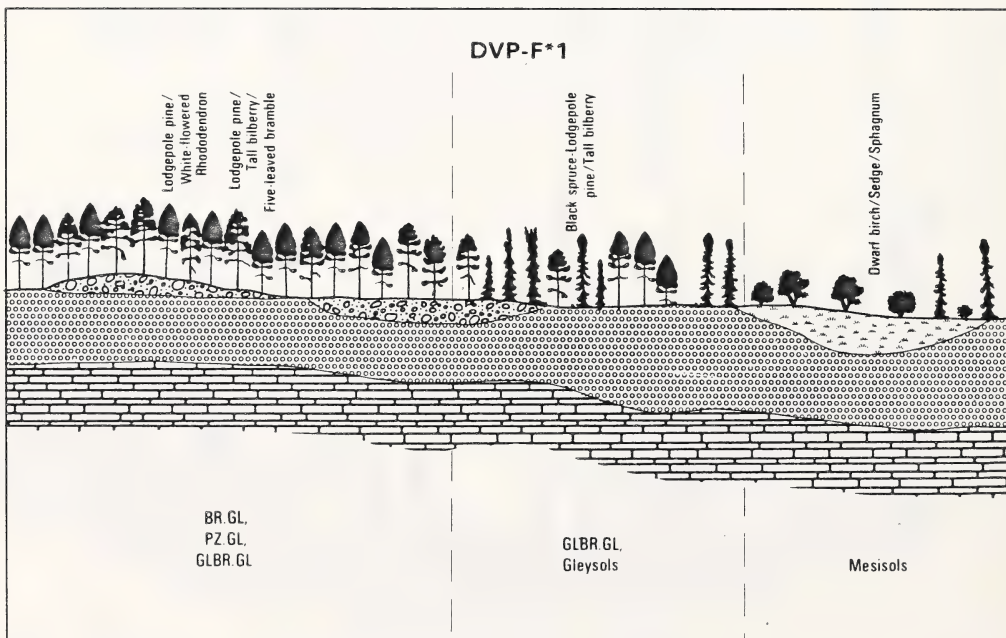


Figure 78: Schematic Diagram of Ecoregion DVP-F*1

DVP-GF01

Physical Conditions:

This hummocky to subdued glaciofluvial outwash plain occurs along the southeastern edge of the plateau (Figure 79). Coarse-textured glaciofluvial materials overlies pre-glacial gravels. Numerous kettle depressions occur throughout the area and contain significant amounts of sphagnum peat. The area has also been extensively eroded by many small, sinuous glacial meltwater channels. Drainage conditions are highly variable but imperfectly drained conditions predominate.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GFv F*	S KSL	0-2	3-4	BR.GL, GLBR.GL	Lodgepole pine/Tall bilberry/Five-leaved bramble Black spruce-Lodgepole pine/Tall bilberry
GF	S	2-5	2-3	BR.GL, E.EB	Lodgepole pine/Tall bilberry/Five-leaved bramble
Ovb F*	Mesic KSL	0-2	5-6	Peaty Gleysols, Mesisols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

Lodgepole pine forest is more common here than elsewhere on the plateau because of the relative dryness of sandy glaciofluvial deposits. Black spruce-lodgepole pine forest occurs where these deposits are thin, and dwarf birch-sedge shrubland is found on peat deposits in kettles and outwash channels.

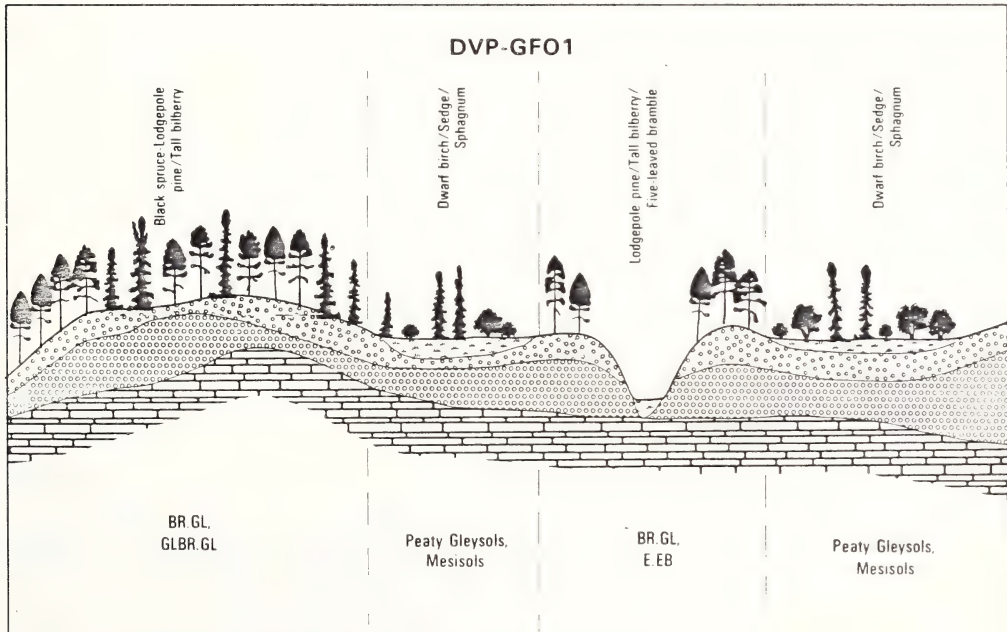


Figure 79: Schematic Diagram of Ecoregion DVP-GF01

Physical Conditions:

Within the valley bottoms of some tributaries, areas of undulating to rolling ground moraine can often be found (Figure 80). These deposits are not extensive and often are overlain by thin fluvial veneers derived from slope wash and periodic flooding. The high cobble content of the materials is the result of mixing of pre-glacial gravels into the till by glacial action. Groundwater seepage tracks are common across the area.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
M	KSIL-KSL	2-15	2-3	O.GL, BR.GL	Lodgepole pine/Labrador tea/ Feathermoss
			3-4	O.GL, GL.GL	Lodgepole pine/Alder/Dewberry
Fv M	SL KSL	2-9	3-4	CU.R, BR.GL, E.EB, GL.CUR, GL.CUR, GLBR.GL	Lodgepole pine/Labrador tea/ Feathermoss White spruce/Feathermoss

Ecoregion: Boreal Uplands

Ecological Conditions

Most of these valley floor deposits are covered with lodgepole pine forest. White spruce stands occur in groundwater discharge areas and on recent alluvial deposits adjacent to stream courses.

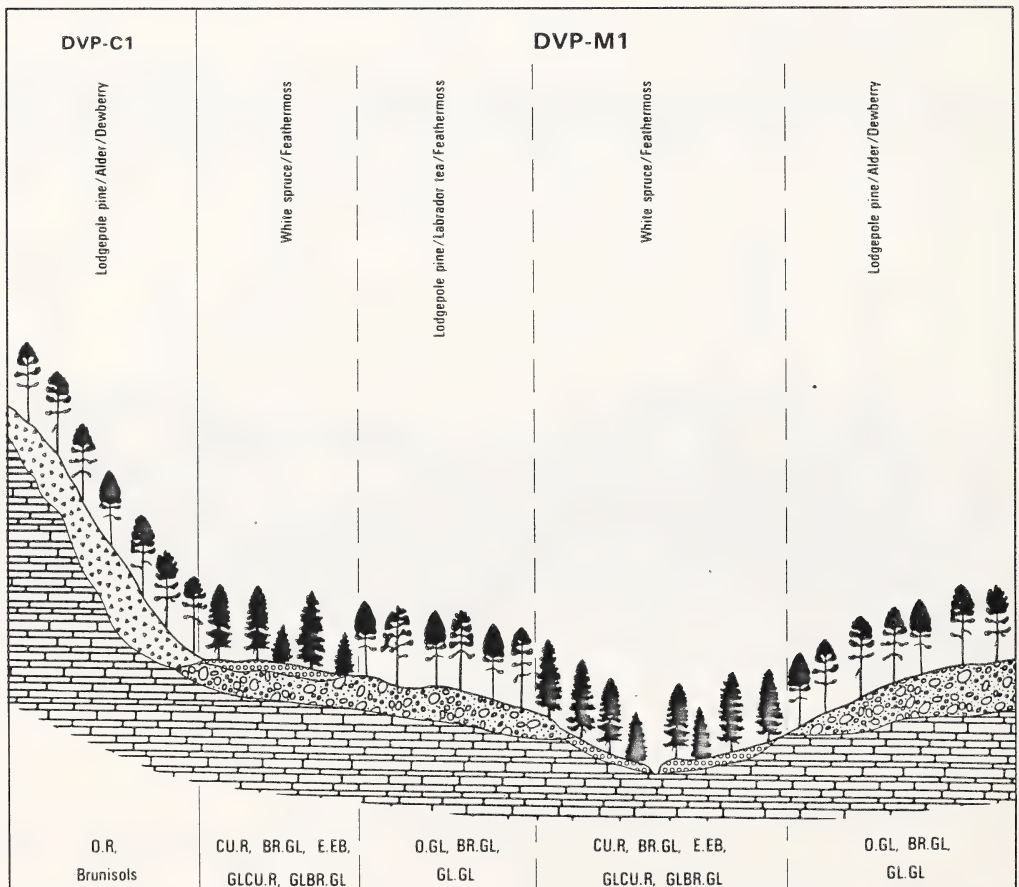


Figure 80: Schematic Diagram of Ecosection DVP-M1

Physical Conditions:

This level to undulating plateau is characterized by strongly cemented pre-glacial gravels which are overlain extensively by accumulations of sphagnum peat (Figure 81). The system contains a large number of sinuous glacial meltwater channels. Cementation of gravels and the presence of slowly permeable bedrock near the surface creates poorly drained conditions over most of this ecosection.

MATERIALS	TEXTURE	SLOPES	DRAINAGE	SOILS	PLANT ASSOCIATION
Ovb F*	Mesic gSL	0-2	5-6	Peaty Gleysols, Mesisols	Dwarf birch/Sedge/Sphagnum Black spruce/Horsetail/Sphagnum
F*	gSL	0-2	4-5	GL.GL, Gleysols	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry

Ecoregion: Boreal Uplands

Ecological Conditions

Excessive soil moisture causes a mixture of sedge, dwarf birch and black spruce-larch fen vegetation to predominate on most of this landscape. Black spruce-lodgepole pine forest occurs on subdued gravel ridges where drainage is somewhat better.

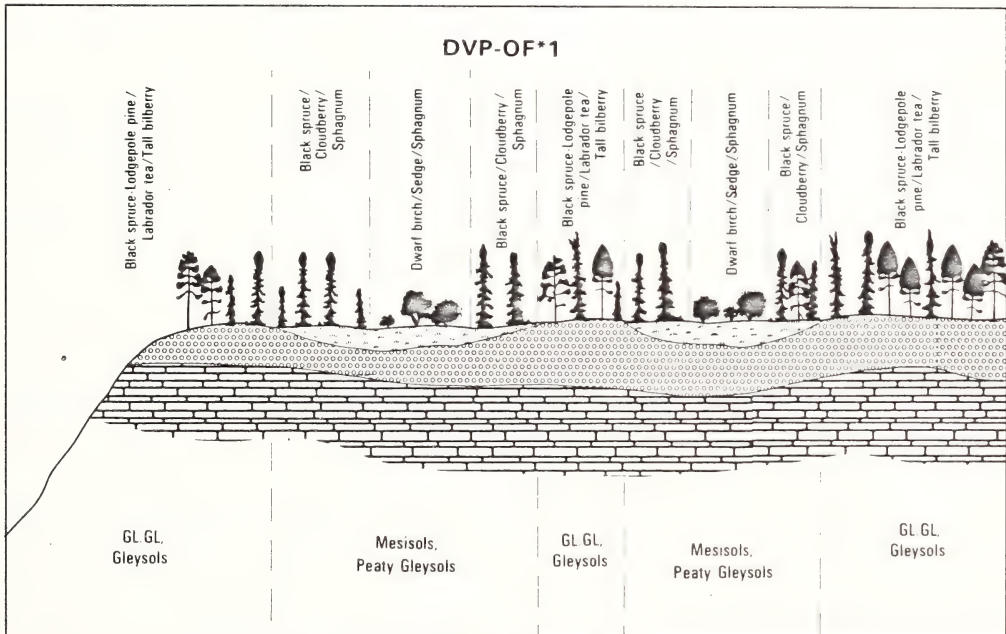


Figure 81: Schematic Diagram of Ecosection DVP-OF*1

2.2.4 Kakwa Benchlands Subregion (Ecodistrict)

The Kakwa Benchlands are centered around the deeply incised river valleys of the Kakwa and Smoky Rivers (Figure 82). This upland area has been deeply dissected by these rivers and their tributaries, leaving a series of northeast-trending ridges. Elevations range from 820 m to 1 500 m with local relief on the dissected uplands in the order of 200 m. The subregion lies within the Boreal Uplands and Subalpine ecoregions, with aspect, seepage and groundwater discharge having major influences on the pattern of vegetation.

Bedrock of the Paskapoo Formation underlies the subregion, and is exposed extensively along both river valleys. Structural deformation of bedrock, while not as pronounced as it is within the Foothills region, is characteristic of the area. The bedrock is thinly masked by till, with fluting marks in the area indicative of ice movement from north to south.

Surficial materials consist predominantly of continental till, with residual materials exposed on uplands where tills are thin. Lodgepole pine forest dominates on the upland positions. Along valley walls where colluvium and undifferentiated materials are common, vegetation consists of a mixture of black spruce/lodgepole pine, white spruce and lodgepole pine forest. Aspen is common on steep slopes in major river valleys where high winds and southern exposures are influential.

Numerous terraces within both the Kakwa and Smoky valleys consist of both glaciolacustrine and outwash sediments. Vegetation on these

portions of the landscape is mixed, with black spruce/pine, aspen/shrubland quite common.

The Kakwa Benchland subregion is divided into twelve ecosections/systems. Generalized descriptions and schematic diagrams follow (Table 17). Seven fluvial systems were identified as crossing the subregion (F8, F11, F13, F17, F18, F12, F22). They are discussed in Section 2.5 of Volume I of the report.

Table 17
SUMMARY OF ECOSECTIONS IN THE KAKWA BENCLANDS SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
KB-C1	Steep, highly eroded slopes	Medium-textured colluvium and till	Aspen and lodgepole pine forest
KB-CX1	Steep, gullied slopes	Medium-textured colluvium and residual materials	Aspen forest
KB-GF1	Level to inclined terraces	Glaciofluvial sand and gravel	Lodgepole pine and aspen forest
KB-GL1	Level terraces	Glaciolacustrine silt and clay	Aspen and lodgepole pine forest, dwarf birch shrublands
KB-M1	Steep upper valley walls	Medium-textured till	Lodgepole pine and black spruce-pine forest, treed muskeg
KB-M2	Moderately sloping plateau	Medium-textured till	Lodgepole pine forest
KB-M3	Rolling ridges	Medium-textured till and peat	Lodgepole pine, black spruce-pine and white spruce forest, shrubby muskeg
KB-MX1	Gentle to steep eroded ridges	Medium-textured till and residual materials	Lodgepole pine forest, shrubby muskeg
KB-MX2	Steep-sided valley and ridges	Moderately fine-textured till and residual materials	Lodgepole pine and black spruce-pine forests
KB-MX3	Inclined to steep ridges	Moderately fine-textured till and residual materials, and peat	Lodgepole pine and white spruce forest, treed and shrubby muskeg
KB-MX4	Rolling ridges	Medium-textured till and residual materials, and peat	Lodgepole pine and Engelmann spruce Subalpine fir forest, deciduous shrublands, grasslands
KB-XM1	Gently undulating plateau	Medium-textured residual materials and tills	Lodgepole pine and black spruce-pine forest

KB-C1

Physical Conditions

This gently inclined to steeply sloping, highly eroded colluvial slope is located along the north side of the Kakwa River (Figure 83). Moraine is common on lower slope positions while residuum is found on steep upper slopes. Bedrock slumps are common throughout this ecosection.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}, \frac{Xv}{R}$	SiL	15-80	2-3	O.EB, O.DYB, E.EB, E.DYB	Aspen/Buffaloberry/Showy Aster Lodgepole pine/Hairy wild rye Lodgepole pine/Alder/Dewberry
$\frac{Mvb}{R}$	SiCL	6-15	2-3	O.GL, BR.GL	Aspen/Buffaloberry/Showy Aster Lodgepole pine/Alder/Dewberry

Ecoregion: Boreal Uplands

Ecological Conditions

Prevailing southern exposures have a substantial influence on the vegetation pattern. Aspen forest is found on steep upper slopes, extending to high elevation because of the drying effects of exposure. Lodgepole pine forest occurs on gentler slopes and in subdued ravines where the soil moisture regime is more favorable. Large, discontinuous patches of deciduous shrubland are found in groundwater catchment areas.

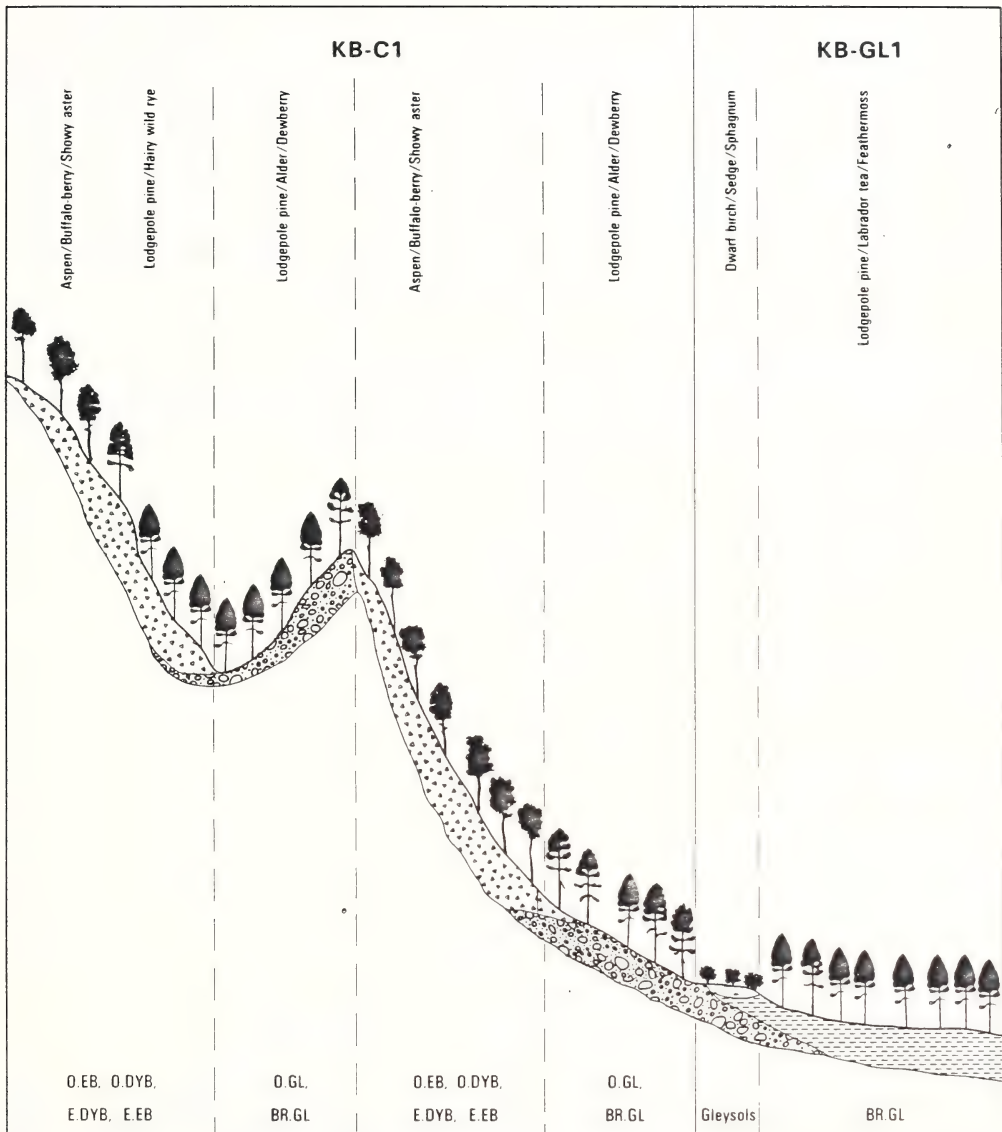


Figure 83: Schematic Diagram of Ecosystems KB-C1 and KB-GL1

Physical Conditions:

This system includes steep upper slopes on both sides of the Smoky River Valley. Colluvium derived from till and weathered sandstone and siltstone is the main surficial material, with residual materials exposed on upper slopes. Gullying is more common on the east side than on the west side of the river.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cv}{R}, \frac{Xv}{R}$	SaL-SiL	16-70	1-3	O.R, Brunisols	Aspen/Buffaloberry/Showy Aster White spruce/Feathermoss

Ecoregion: Boreal Uplands

Ecological Conditions

The relatively warm climate and high winds associated with this large valley causes aspen forest to cover most of the landscape. White spruce stands are confined to northern exposures in gullies. There are a few lodgepole pine stands on gentler slopes in the northern part of the ecosection.

Physical Conditions:

This system consists of a series of level to strongly inclined, highly eroded glaciofluvial terraces bordering the Smoky River (Figure 84). Surficial materials include coarse textured sands and gravels.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GF	S gSCL-gSL	0-9	1-3	E.EB, BR.GL	Lodgepole pine/Labrador tea/ Feathermoss Aspen/Low-bush cranberry/Wild sarsaparilla

Ecoregion: Boreal Uplands

Ecological Conditions

Rapid drainage and the low nutrient status of these coarse-textured materials causes lodgepole pine forest to predominate on these terraces. Aspen stands occur where these terraces have been eroded to expose materials with better moisture-holding ability.

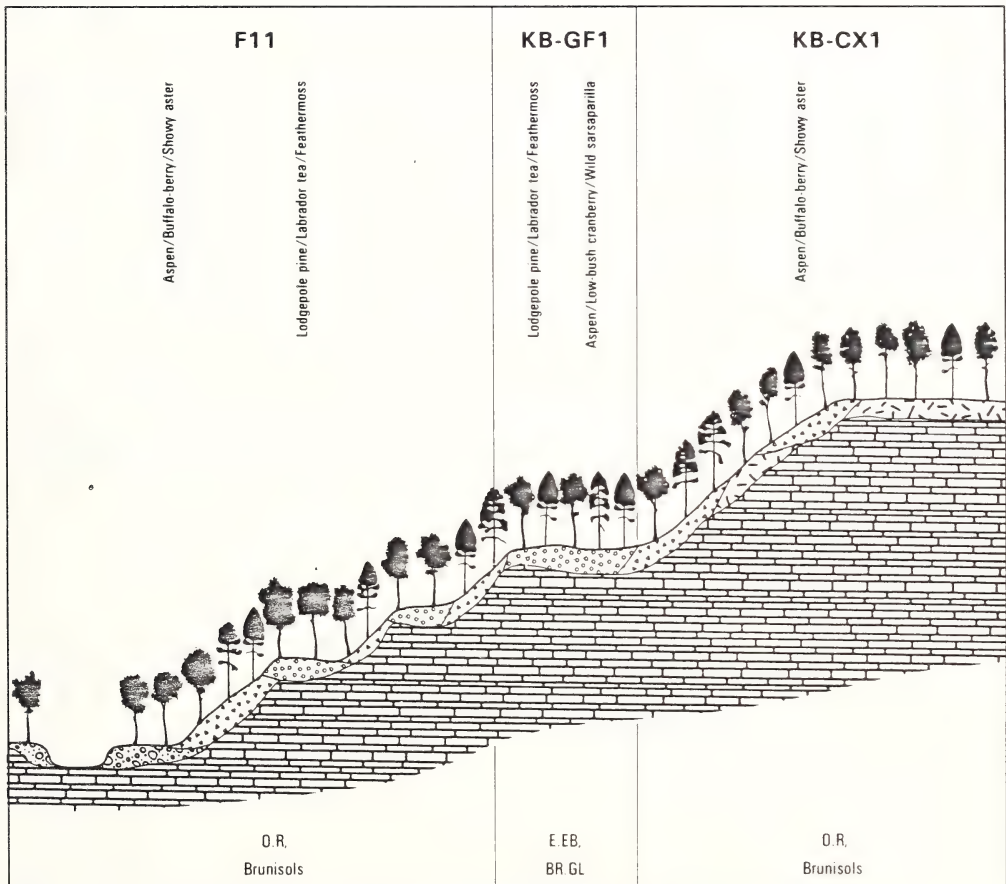


Figure 84: Schematic Diagram of Ecosections KB-GF1, KB-CX1 and F11

Physical Conditions

These glaciolacustrine terraces are located adjacent to the confluence of Copton Creek and the Kakwa River (Figure 83). Thick, medium to fine textured, stratified glaciolacustrine sediments are the principal surficial materials. Minor accumulations of sphagnum peat occur south of the Kakwa River.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GL	SiCL	0-2	2-3	BR.GL	Aspen/Buffaloberry/Showy Aster Lodgepole pine/Labrador tea/ Feathermoss
Ov GT	Mesic CL	0-2	5-6	Peaty Gley- sols, Mesi- sols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

The relatively coarse-texture of these glaciolacustrine materials allows a mixture of aspen and lodgepole pine forest to predominate on these terraces. Further downstream, on finer materials, black spruce forest is the characteristic vegetation type.

Groundwater accumulation areas, which are common on the south side of the river, support deciduous shrubland.

Physical Conditions:

Situated along the upper valley walls of the Kakwa River, this system consists primarily of till deposits of Continental origin with significant portions of residual sandstone materials and colluvium. Surface expression varies from ridged to strongly inclined with slopes ranging from gentle to very strong (Figure 85). Colluvium and residual sandstone materials are common on steep upper slopes where till deposits have been eroded away. On gentler slopes, till deposits are commonly overlain by thin fluvial veneers derived from slope wash. Gleysols occur at the base of slopes where groundwater discharge is common.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$, $\frac{Xb}{R}$	CL-SL	2-30	2-3	O.GL, BR.GL, E.DYB	Lodgepole pine/Alder/Dewberry Lodgepole pine/Twisted stalk/ Feathermoss Lodgepole pine/Labrador tea Feathermoss Lodgepole pine/Tall bilberry/Five- leaved bramble
$\frac{Cv}{R}$	SiL	16-45	2-3	E.DYB	Lodgepole pine/Alder/Dewberry
$\frac{Fv}{M}$	$\frac{SL}{SiL}$	6-15	3-5	E.EB, CU.R, GLE.EB, Gleysols	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry Lodgepole pine/Labrador tea-Tall bilberry
$\frac{Ov}{M}$	$\frac{Mesic}{SiL}$	0-2	5	Peaty Gley- sols	Black spruce/Horsetail/Sphagnum

Ecoregion: Boreal Uplands
Subalpine

Ecological Conditions

A variety of lodgepole pine communities are found on better drained uplands, but the extensive occurrence of numerous seepage tracks supporting black spruce-lodgepole pine forest and large expanses of open black spruce forest with extensive shrub cover points to the wide-spread influence of groundwater movement in this ecosection.

Physical Conditions:

Consisting of a narrow plateau and side slopes located north of Prairie Creek (Figure 85), this system is nearly level to inclined with slopes varying from gentle to very strong. Continental tills of variable thicknesses are the principal surficial materials, but residual sandstone materials occur on side slopes where tills have been eroded.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}, \frac{Xvb}{R}$	kSiL-SL	9-30	2-4	BR.GL, E.DYB, GLBR.GL	Lodgepole pine/Labrador tea-Tall bilberry Lodgepole pine/White-flowered rhododendron/Feathermoss Lodgepole pine/ Alder/Dewberry Lodgepole pine/Twisted stalk/ Feathermoss

Ecoregions: Boreal Uplands
Subalpine

Ecological Conditions

A lower incidence of groundwater discharge distinguishes this ecosection from the preceding one (KB-M1). Lodgepole pine communities predominate on well drained uplands, and deciduous shrubland is confined to a few small slumps where groundwater accumulates. A few white spruce stands are found on lower slopes.

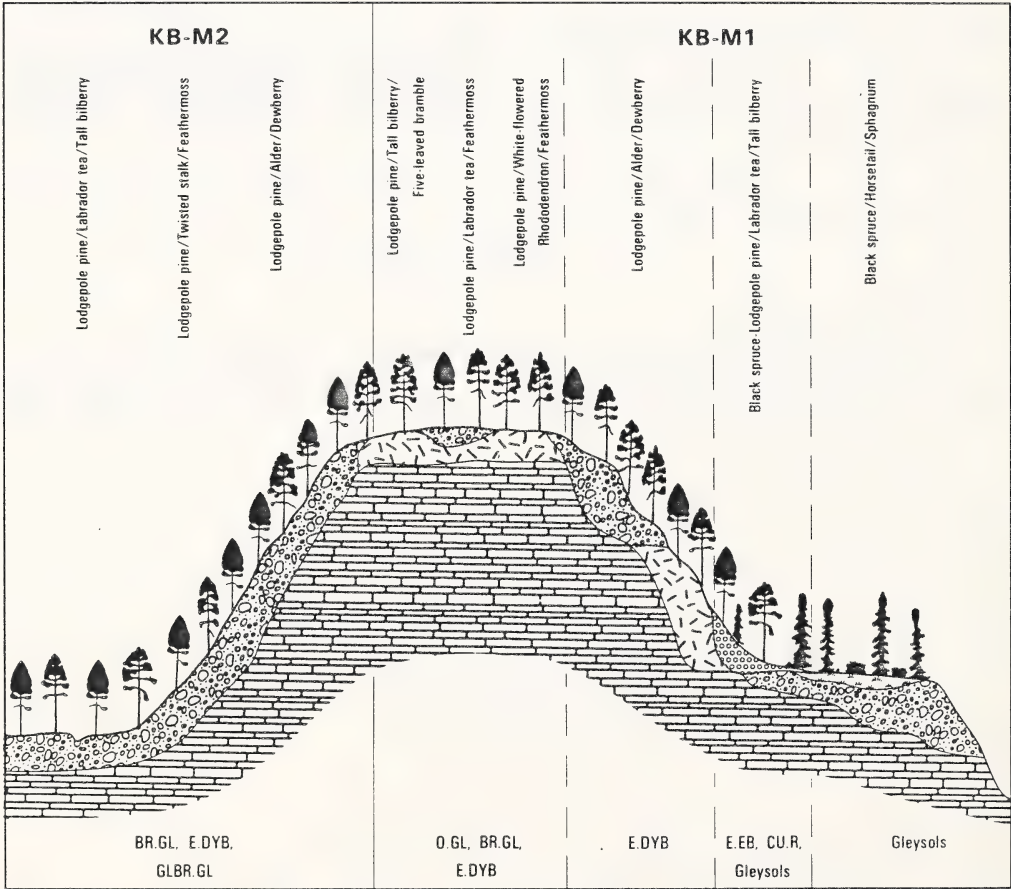


Figure 85: Schematic Diagram of Ecosections KB-M1 and KB-M2

Physical Conditions:

This subdued to ridged upland area (Figure 86) separates the Kakwa from the Smoky River and consists of a series of broad, northeast trending bedrock ridges. Surface expression is inclined to rolling. Bedrock ridges are overlain by Continental tills of variable thickness and are commonly overlain on lower slope positions by thin fluvial veneers. Seepage is a common feature of slopes. Local colluvial materials derived from weathered tills are the result of slope failure.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mvb R	SiL-SL	15-30	3-4	O.GL, BR.GL	White spruce/Feathermoss White spruce/Low-bush cranberry/ Dewberry
		2-30	2-4	O.GL, BR.GL	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Lodgepole pine/Labrador tea/ Feathermoss
Fv M	SL SiL	2-9	4-5	GL.GL, Gley- sols	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry White spruce/Common horsetail

Ecoregion: Boreal Uplands
Boreal Foothills

Ecological Conditions

White spruce forest predominates on the side slopes of these ridges, where moderate amounts of groundwater discharge create a favorable moisture regime. A mixture of black spruce-pine forest, white spruce forest and deciduous shrubland is found in groundwater discharge areas on lower slopes. Pure lodgepole pine forest is confined to narrow, well-drained ridgetops.

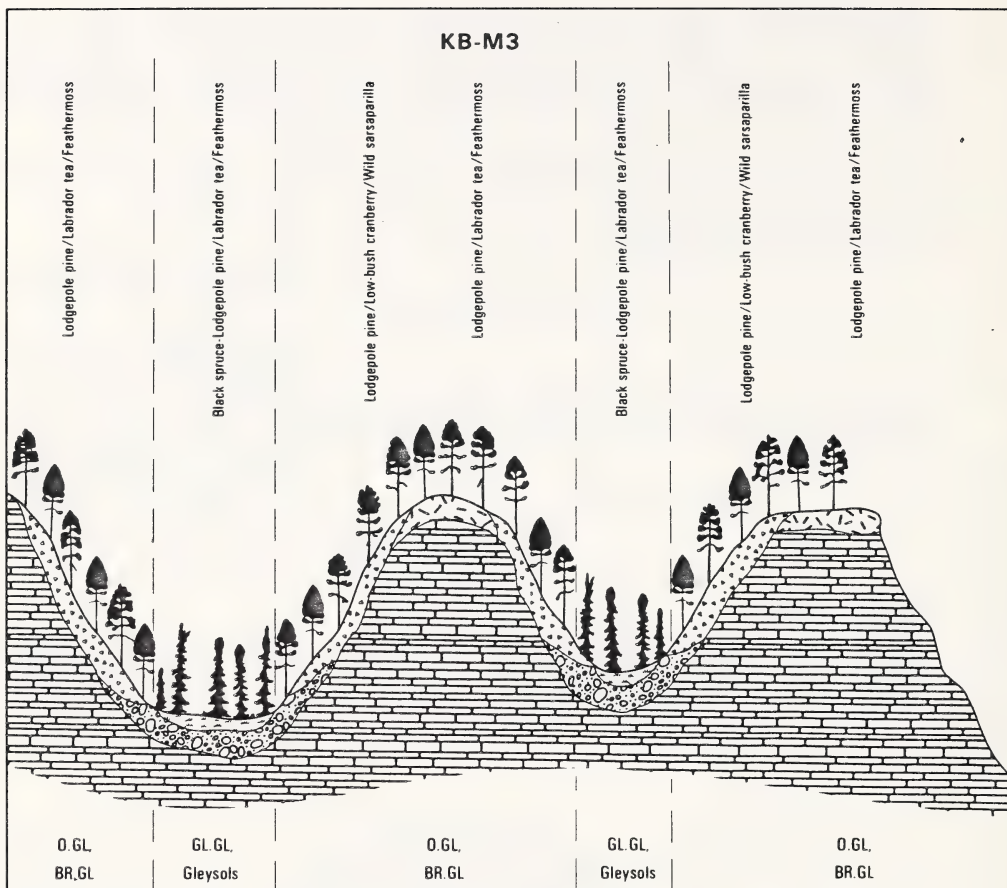


Figure 86: Schematic Diagram of Ecosection KB-M3

Physical Conditions:

These are the side slopes of a highly dissected ridge (Figure 87) separating Bolton and Norris Creek watersheds and consists of a complex of Continental tills and residual sandstone materials overlying bedrock. Residuum is common on steeper topography where till deposits have been eroded. Because of the very strongly sloping topography and pronounced seepage, a significant amount of colluvium derived from weathered bedrock and till deposits occurs where bedrock has failed. Surficial materials are of variable thickness, with deposits generally thickest on lower slope positions and valley bottoms. Surface expression is inclined and ridged with slopes ranging from gentle to very strong.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb, Xvb}{R \quad R}$	SiCL-kSiL	6-30	2-4	BR.GL, O.GL, GL.GL	Lodgepole pine/Twisted stalk/ Feathermoss Lodgepole pine/Alder/Dewberry White spruce/Feathermoss Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry
$\frac{Cv}{R}$	kSiL	16-45	1-3	O.R., O.EB	Lodgepole pine/Hairy wild rye Aspen/Buffaloberry/Showy aster White spruce/Feathermoss
$\frac{Ov}{M}$	$\frac{Mesic}{KSTL}$	0-2	5	Peaty Gley- sol	Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

A mixture of lodgepole pine and white spruce forest is found along Bolton Creek Valley where till deposits are relatively thick. Farther west in the valley of Norris Creek, thinner materials, more rugged topography and pronounced groundwater movement combine to produce a more heterogeneous vegetation pattern. Lodgepole pine forest predominates on well-drained uplands, black spruce-pine forest and deciduous shrublands are found in groundwater discharge areas, and aspen stands occur on steep southern exposures.

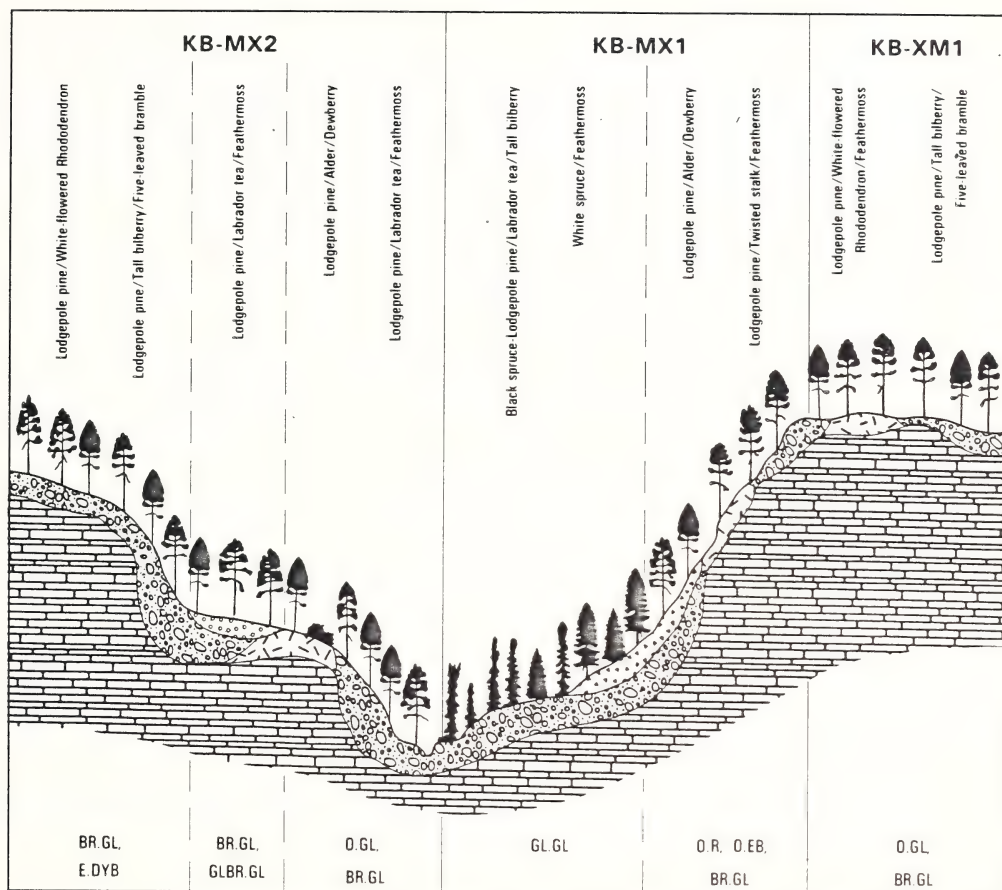


Figure-87: Schematic Diagram of Ecosections KB-MX1, KB-MX2 and KB-XM1

Physical Conditions:

This north-trending bedrock ridge (Figure 87) occurs west of Norris Creek and consists of a complex of Continental tills and residuum of variable thicknesses overlying bedrock. Till deposits are generally thicker in valley bottoms with residual sandstone materials occurring on upper slope positions where till deposits are either thin or have been eroded. Seepage is common and fluvial veneers derived from slope wash commonly overlie till deposits on lower slope positions. A small basin-like feature in the landscape contains significant glaciofluvial deposits which resulted from the overflow of glacial meltwaters from adjacent valleys into Norris Creek valley. The combination of fluting marks and small eskers produce a ridged surface expression over most of this system.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}, \frac{Xvb}{R}$	SiCL	2-45	2-3	O.GL, BR.GL, E.DYB	Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/White-flowered rhododendron/Feathermoss Lodgepole pine/Alder/Dewberry Lodgepole pine/Tall bilberry/ Five-leaved bramble
$\frac{GFvb}{M}$	$\frac{SL}{SiCL}$	2-15	2-3	BR.GL, GLBR.GL	Lodgepole pine/Labrador tea/ Feathermoss
$\frac{Fv}{M}$	$\frac{SL}{SiCL}$	0-6	3-4	CU.R, BR.GL, GLCU.R, Gleysols	Black spruce/Lodgepole pine/ Labrador tea/Tall bilberry

Ecoregions: Boreal Uplands
Subalpine

Ecological Conditions

Lodgepole pine forest predominates in the headwater portions of this valley but closer to the Smoky River, variation in moisture regimes and the occurrence of fire creates a more complex vegetation pattern. Black spruce-pine forest is found in groundwater discharge areas while slopes that have been burned currently support dense shrubland dominated by alder.

Physical Conditions:

This system consists of a series of north-trending bedrock ridges on which Continental tills and residual sandstone materials thinly mask the underlying bedrock (Figure 88). Surface expression is inclined to ridged with slopes ranging from gentle to strong. Residuum is most common on upper slope positions where tills are either thin or have been eroded. Fluvial veneers derived from slope wash commonly overlie till deposits on lower slope positions. Relatively deep accumulations of sphagnum peat occur locally in narrow valley bottoms. Groundwater discharge is common on lower slopes

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}, \frac{Xvb}{R}$	SL-SL	9-30	2-3	O.GL, BR.GL, E.DYB, E.EB	Lodgepole pine/Alder/Dewberry/ Lodgepole pine/Twisted-stalk/ Feathermoss
$\frac{Fv}{M}$	$\frac{S}{SL}$	2-15	3-4	E.DYB, E.EB, CU.R, GLE.EB, GLCU.R	Lodgepole pine/Labrador tea/ Feathermoss White spruce/Feathermoss
$\frac{Ovb}{M}$	$\frac{Mesic}{SL}$	0-2	5-6	Peaty Gley- sols, Mesi- sols	Black spruce/Horsetail/Sphagnum Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

Topographically-controlled variation in soil moisture controls the pattern of vegetation, with lodgepole pine forest on well-drained bedrock ridges and open black spruce forest and shrubland on poorly-drained valley bottoms. Exposure has a minor effect because of the north-south orientation of these valleys.

Physical Conditions:

This bedrock controlled upland area occurs immediately south of Prairie Creek and is characterized by north-trending bedrock ridges separated by narrow valleys (Figure 88). Surface expression is inclined to rolling and slopes vary from gentle to very strong.

Surficial materials are of variable thickness and consist chiefly of Continental tills and residual sandstone materials, the latter occurring locally on steep slopes. Till deposits overlain by fluvial veneers derived from slope wash occur on lower slope positions. Groundwater discharge is pronounced in these areas.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}, \frac{Xvb}{R}$	SiL-SL	15-45	1-3	BR.GL, E.DYB E.EB	Lodgepole pine/White-flowered rhododendron/Feathermoss Engelmann spruce-Subalpine fir/ White-flowered rhododendron/ Feathermoss Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/Hairy wild rye
$\frac{Fv}{M}$	$\frac{SL}{SiL}$	0-6	3-4	CU.R, GLCU.R, Gleysols	Dry meadow-fluvial
$\frac{Ov}{M}$	$\frac{Mesic}{SiL}$	0-6	5-6	Mesisols	Dwarf birch/Sedge/Sphagnum

Ecoregions: Subalpine
Boreal Uplands

Ecological Conditions

The occurrence of lodgepole pine and Engelmann spruce-subalpine fir forest on well-drained ridges reflects the regional climate, but local patterns of erosion, deposition and groundwater movement create a heterogeneous vegetation pattern within valleys. Upper, eroded slopes are quite dry and support a mixture of open pine forest and dry grassland. Valley bottoms have a mixture of dwarf birch shrubland on organic soils in groundwater discharge areas, and dry grassland communities on thick, relatively well-drained slope wash deposits.

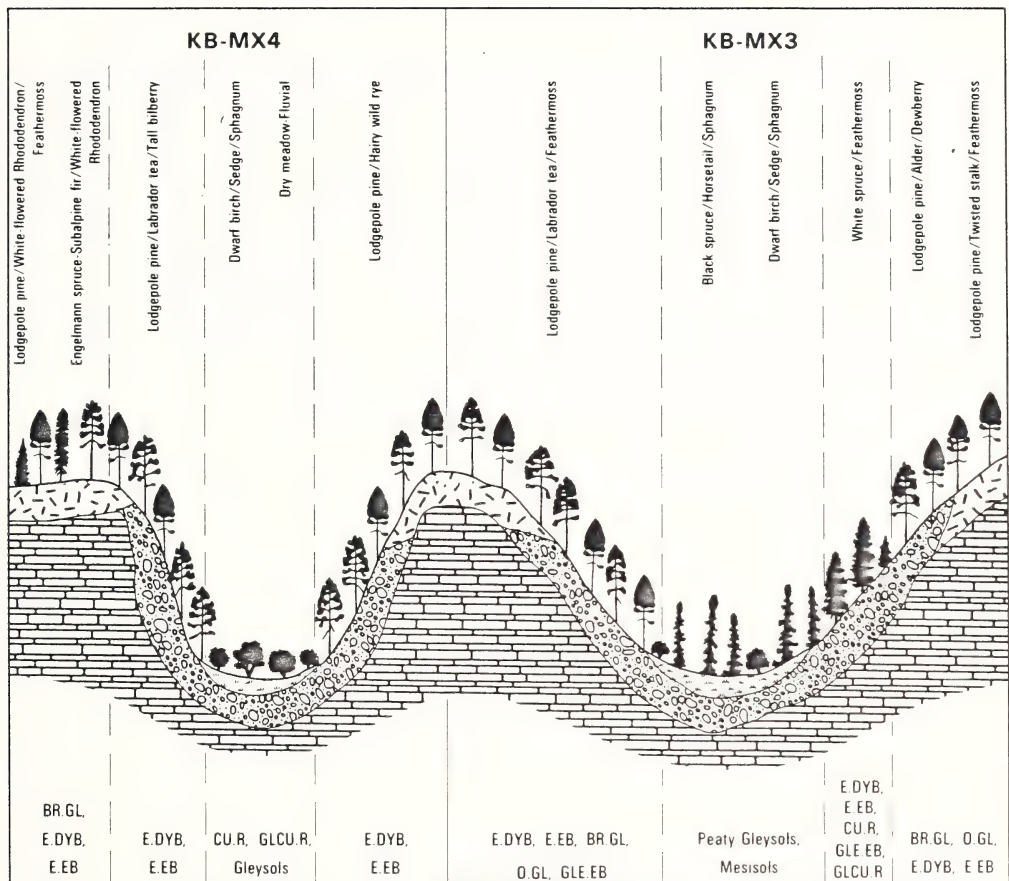


Figure 88: Schematic Diagram of Ecosections KB-MX3 and KB-MX4

KB-XM1

Physical Conditions:

This subdued to gently undulating plateau remnant acts as a drainage divide between Norris and Bolton Creek (Figure 87). Surficial materials consist chiefly of residual sandstone materials with minor inclusions of Continental till.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Xb}{R}, \frac{Mv}{R}$	SiCL-kSiL	2-9	2-4	O.GL, BR.GL, GL.GL, GLBR.GL	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Tall bilberry/Five- leaved bramble Black spruce-Lodgepole pine/Tall bilberry

Ecoregion: Subalpine

Ecological Conditions

This plateau provides a relatively homogeneous environment within which the prevalence of lodgepole pine forest is an expression of the regional climate.

2.2.5 Little Smoky Plain Subregion (Ecodistrict)

The subregion is found in the extreme southeastern portion of the study area and is dissected by the Little Smoky Plain River Valley (Figure 89). The plain consists of a series of rolling till covered slopes underlain by bedrock of the Paskapoo Formation. Numerous sinuous glacial meltwater channels are typical of this subregion and are accompanied by thin veneers of glaciofluvial materials over much of the landscape. Extensive peat deposits occur on depressional terrain and in meltwater channels.

The subregion falls within both the Boreal Uplands and the Subalpine ecoregions, with the latter occurring above 1 280 m. The vegetation pattern reflects both drainage conditions and materials.

Till deposits of Continental origin are the principal surficial material. Over much of the subregion the till is overlain by thin glaciofluvial sediments. Closed lodgepole pine forests have developed on the till. Where strongly acidic glaciofluvial materials overlie till deposits, black spruce is a major component of the overstory vegetation. Open black spruce muskeg and dwarf birch shrublands are found on peat deposits.

The Little Smoky Valley subregion is divided into four systems/ecosections (Table 18). Detailed descriptions follows the table. Two fluvial systems were noted (F25, F28); their characteristics are discussed in Section 2.5 of Volume I of the report.

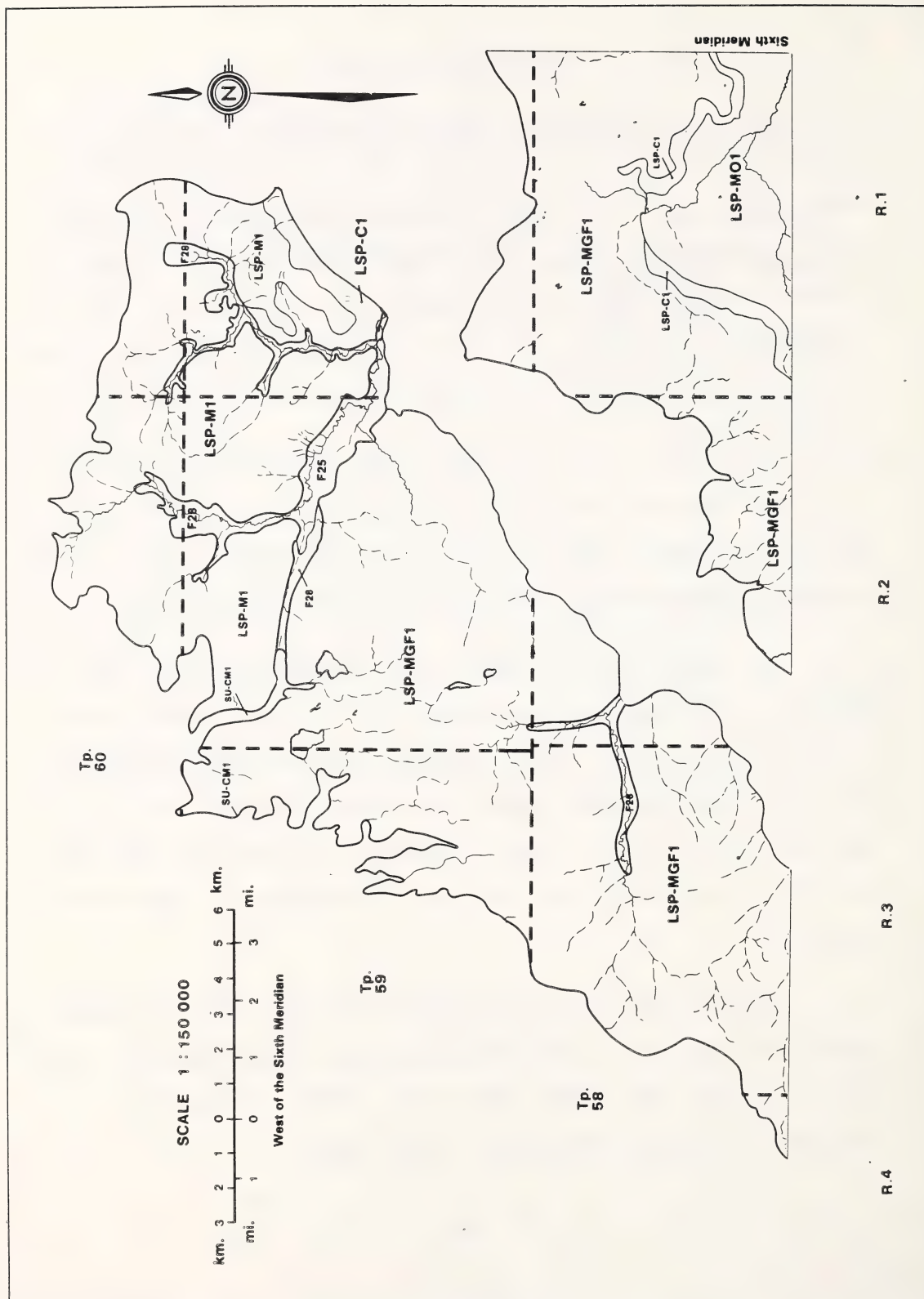


Figure 89: Little Smoky Plain Subregion (LSP)

Table 18

SUMMARY OF ECOSECTIONS IN THE LITTLE SMOKY PLAIN SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
LSP-C1	Steep, gullied slopes	Medium-textured colluvium	Lodgepole pine forest
LSP-M1	Rolling till plain	Medium to moderately fine-textured till and peat	Lodgepole pine and white spruce forest, muskeg
LSP-MGF1	Undulating ridge	Glaciofluvial sand over medium-textured till	Lodgepole pine and black spruce-pine forest, muskeg
LSP-M01	Gently sloping basin	Medium-textured till and peat	Lodgepole pine and black spruce-pine forest, muskeg

Physical Conditions

This system (Figure 90) occurs both north and south of the Little Smoky River and consists of inactive colluvial materials of variable thicknesses overlying strongly to very strongly sloping bedrock. Colluvium is derived from weathered bedrock and deposits of Continental till. Surface runoff has created several gullies across these slopes.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	kSiL-SL	16-45	2-4	BR.GL, E.DYB, GLBR.GL	Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/Twisted stalk/ Feathermoss Lodgepole pine/Alder/Dewberry

Ecoregion: Boreal Uplands

Ecological Conditions

Groundwater seepage creates a favorable moisture regime on these slopes, even on steep southern exposures. Lodgepole pine forest is the dominant vegetation type, and alder is a common component of the understorey. Forest cover acts to stabilize these slopes, even in the presence of seepage.

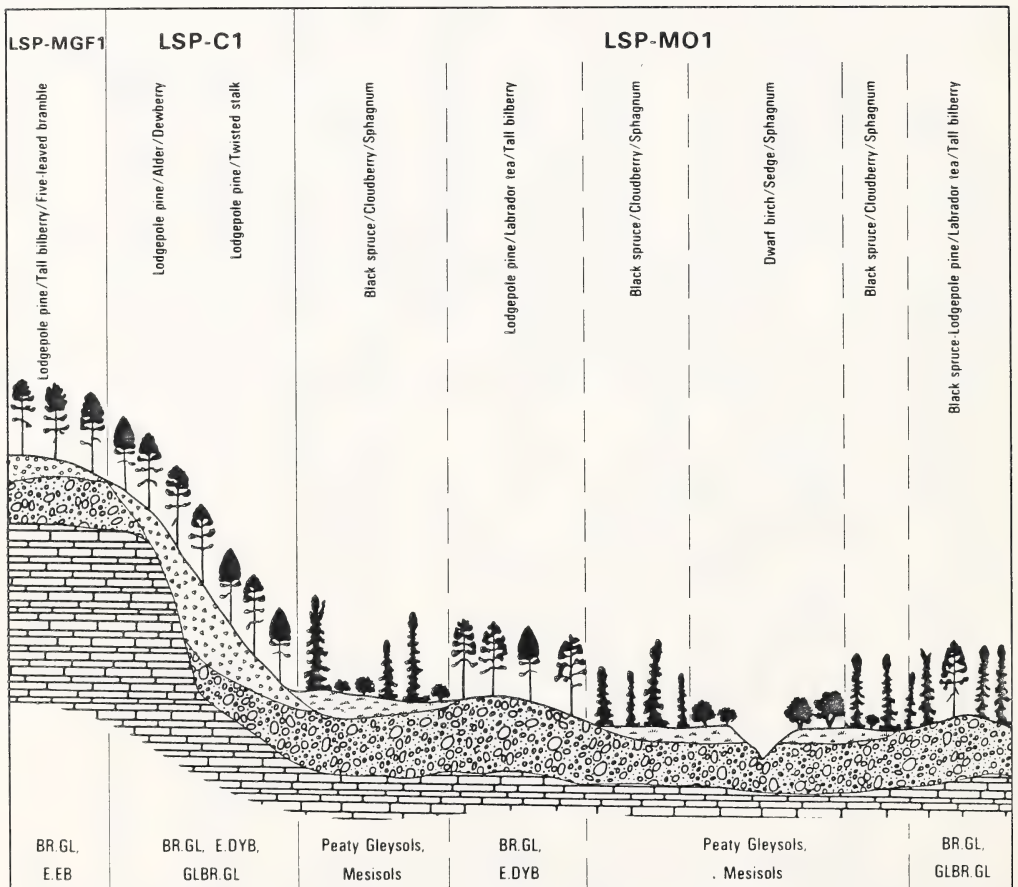


Figure 90: Schematic Diagram of Ecosections LSP-C1, LSP-MGF1 and LSP-MO1

Physical Conditions

Located between the Deep Valley Plateau and the Little Smoky River, this system consists of gently to moderately rolling and ridged deposits of Continental till overlying bedrock (Figure 91). The system is strongly dissected by numerous tributary streams to the Little Smoky River which often occupy former glacial meltwater channels. Small organic accumulations of sphagnum peat develop locally within these channels. Surface runoff from the adjacent Deep Valley Plateau results in surface erosion and the deposition of thin fluvial veneers over till deposits.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	kSiL-SiCL	6-15	2-3	O.GL, BR.GL	Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/Labrador tea-Tall bilberry
			3-4	BR.GL, GLBR.GL	White spruce/Feathermoss
$\frac{Ovb}{M}$	Mesic SiCL	0-2	5-6	Peaty Gley- sols, Mesi- sols	Black spruce/Common horsetail/ Feathermoss Black spruce/Horsetail/Sphagnum Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands
Subalpine

Ecological Conditions

Most of the ecosection is covered with lodgepole pine forest, a reflection of the regional climate. Extensive stands of white spruce occur on steep slopes adjacent to the Deep Valley Plateau, where runoff is a significant ecological factor. Poorly-drained valley bottoms (including glacial meltwater channels) support open black spruce forest and dwarf birch shrublands, but most of these have been classified in separate ecosections (fluvial system F28).

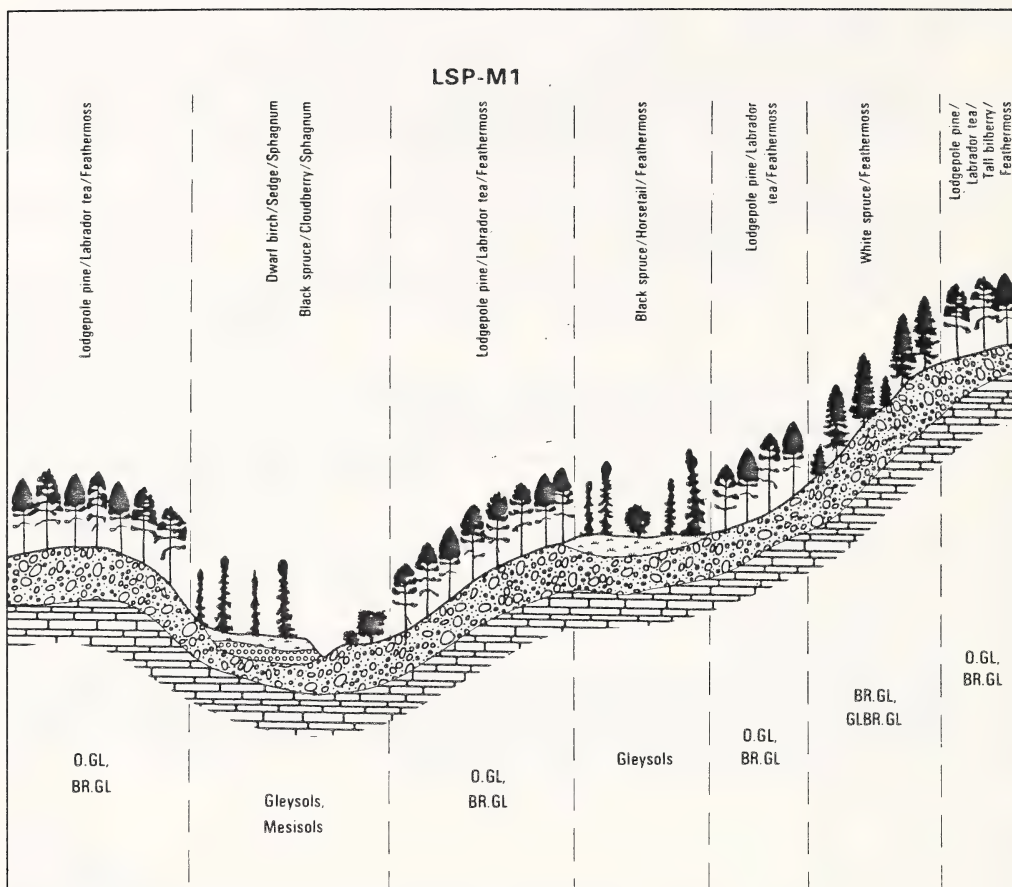


Figure 91: Schematic Diagram of Ecosection LSP-M1

Physical Conditions

This subdued to strongly undulating upland area occurs adjacent to the Little Smoky River and consists of thick till deposits of Continental origin overlain by stony, coarse-textured glaciofluvial veneers (Figure 92). Numerous small glacial meltwater channels occur across the system and are generally oriented in a north-south direction. Thick glaciofluvial deposits occur along the bottoms of glacial meltwater channels and are associated with significant amounts of sphagnum peat. Several small kettle lakes occur west of the Little Smoky River.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
M, Mb R	SiL-SL	2-30	2-4	BR.GL, E.EB, GLBR.GL	Lodgepole pine/Tall bilberry/Five-leaved bramble Lodgepole pine/White-flowered rhododendron/Feathermoss
GFvb M	kSL	2-15	2-4	BR.GL, E.DYB, GLBR.GL	Lodgepole pine/Tall bilberry/Five-leaved bramble Black spruce-Lodgepole pine/Tall bilberry
Ovb, Ovb M GF	Mesic SiL-kSL	0-2	5-6	Peaty Gleysols, Mesisols	Dwarf birch/Sedge/Sphagnum Black spruce/Horsetail/Sphagnum

Ecoregion: Subalpine
Boreal Uplands

Ecological Conditions

The composition of the upland forest is influenced by the pattern of deposition of surficial materials and by downslope movement of groundwater. Lodgepole pine forest is found on till deposits at high elevations. Seepage through sand overlays found at lower elevations creates rapid local variation in drainage, with open pine forest found on elevated sites and black spruce-pine forest on low-lying terrain. Peat deposits that have filled glacial meltwater channels support open black spruce forest and dwarf birch shrubland.

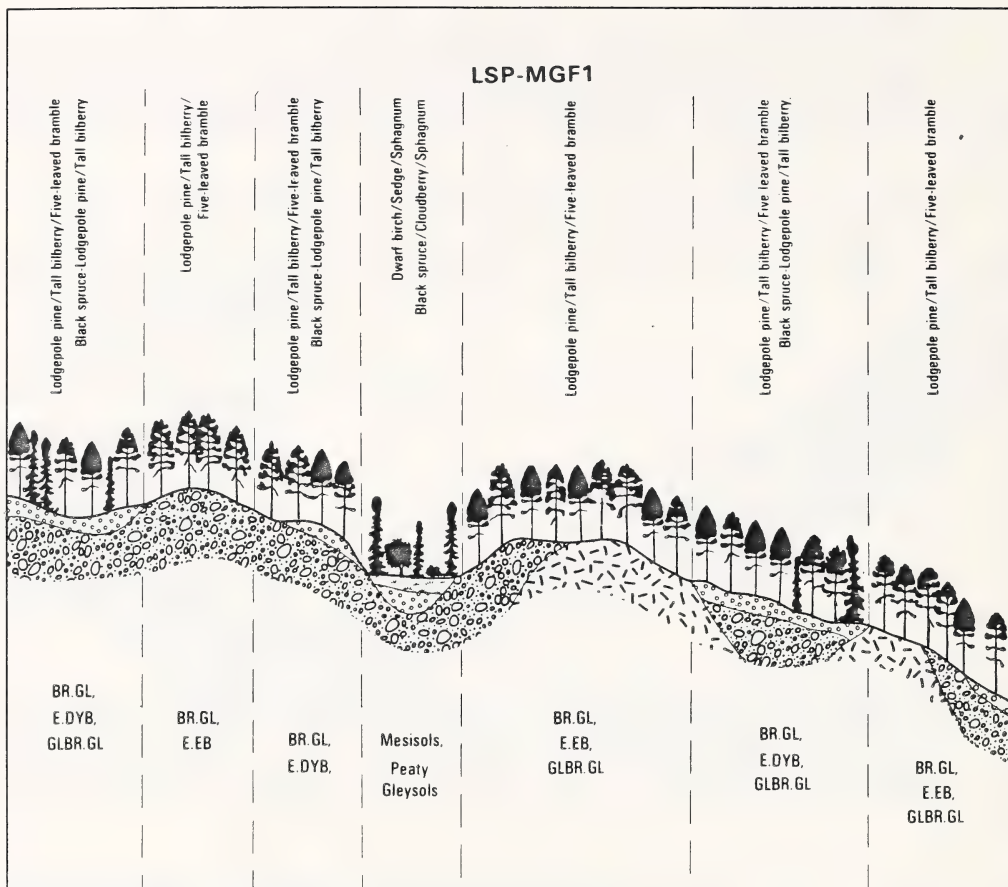


Figure 92: Schematic Diagram of Ecosection LSP-MGF1

Physical Conditions

Located in the extreme southeastern portion of the study area, this system consists of a complex of Continental till with extensive organic accumulations of sphagnum peat overlying nearly level to gently sloping bedrock (Figure 90). The system occupies a basin-like feature in the landscape in which groundwaters concentrate.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	kSiL-SL	2-9	3-4	BR.GL, E.DYB, GLBR.GL	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry Lodgepole pine/Labrador tea/Tall bilberry
$\frac{Ovb}{M}$	$\frac{Mesic}{kSiL}$	0-2	5-6	Peaty Gley- sols, Mesi- sols	Dwarf birch/Sedge/Sphagnum Black spruce/Horsetail/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

An abundance of soil moisture is reflected in the predominance of black spruce-lodgepole pine forest on slightly elevated till deposits, with lodgepole pine forest confined to ridge crests. Groundwater movement is evident in the development of ribbed fens characterized by open black spruce muskeg and dwarf birch shrublands.

2.2.6 Little Smoky Valley Subregion (Ecodistrict)

Located in the southeastern portion of the study area (Figure 93), the valley is a well-defined glacial outwash channel currently occupied by the Little Smoky River. The subregion is characterized by numerous kames, eskers, oxbow lakes, meander scars and glacial meltwater channels. Elevations range from 1 295 m in the west to 1 175 m in the east, adjacent to the Little Smoky River, with local relief in the order of 30 m.

Bedrock of the Paskapoo Formation is masked by a complex of Continental till and glaciofluvial sediments. The glaciofluvial sediments are underlain by either glaciolacustrine or till materials and vary from a mixture of sand and gravels to sand and silts. Drainage varies depending upon thickness and nature of the underlying materials. Organic accumulations are extensive and are generally confined to glacial meltwater channels and depressional terrain.

The subregion occurs within the Boreal Uplands ecoregion, however, modal sites are rare. Closed black spruce/lodgepole pine forest is dominant with wetland areas supporting a mixture of dwarf birch and black spruce.

The Little Smoky Valley subregion is divided into three ecosection/systems (Table 19). One fluvial system was identified (F28) and is discussed in Section 2.5 of Volume I.

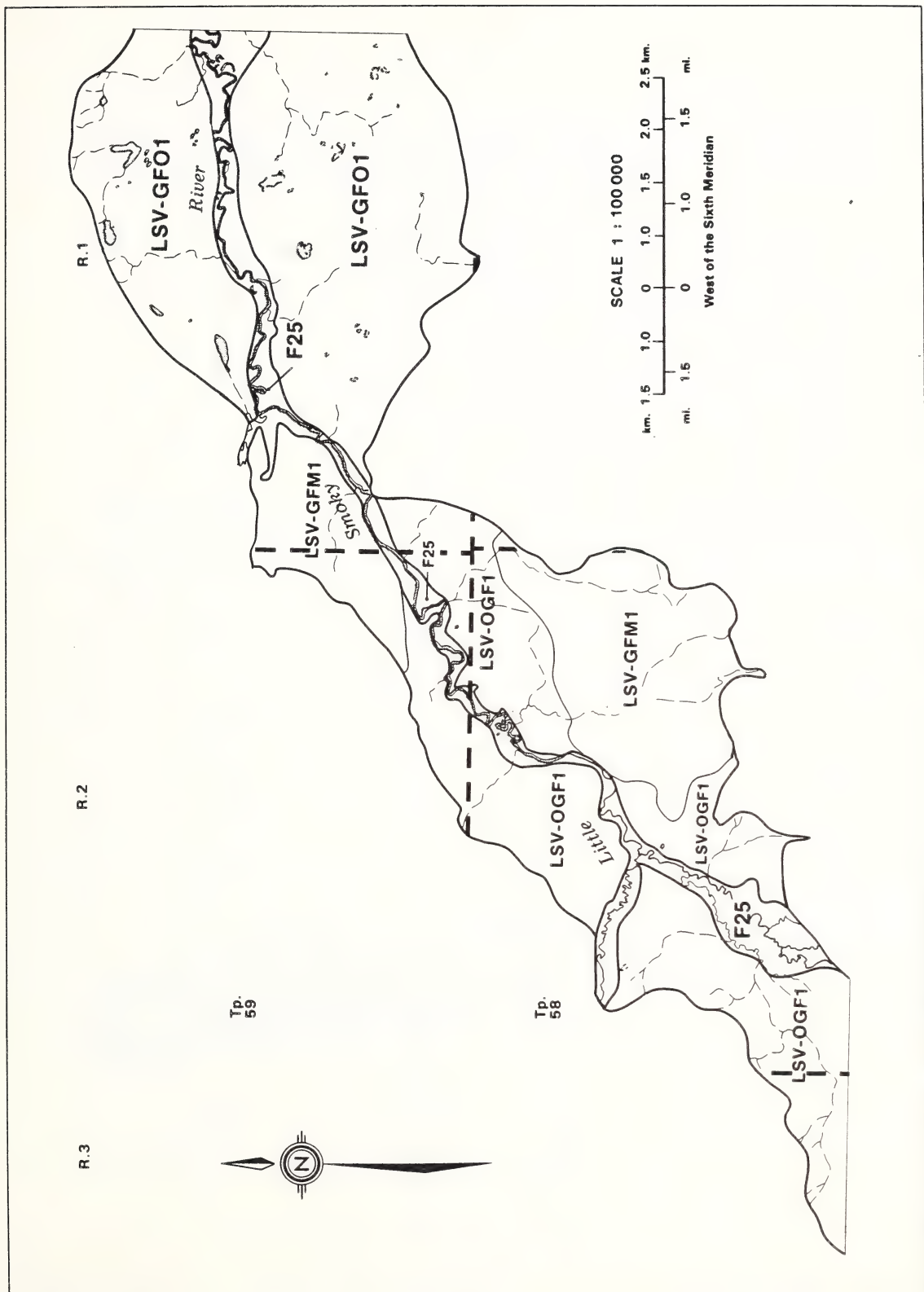


Figure 93: Little Smoky Valley Subregion (LSV)

Table 19

SUMMARY OF ECOSECTIONS IN THE LITTLE SMOKY VALLEY SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
LSV-GFM1	Rolling ridge and basin	Glaciofluvial sand over medium-textured till and peat	Lodgepole pine, black spruce-pine and black spruce forest, muskeg
LSV-GF01	Rolling valley floor	Glaciofluvial sand and peat	Black spruce-Lodgepole pine and lodgepole pine forest, shrubby muskeg
LSV-0GF1	Nearly level valley floor	Peat and glaciofluvial sand	Black spruce and lodgepole pine forest, muskeg

Physical Conditions

This system includes a low-lying ridge on the north side of the Little Smoky River, and a small basin on the south side (Figure 94). Surficial deposits consist of gently inclined to moderately rolling deposits of Continental till overlain by coarse-textured glaciofluvial materials of variable thickness. The thickness of glaciofluvial deposits decreases with increasing distance from the Little Smoky River. Peat deposits are more common on the south side of the Little Smoky River.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GFvb M	S SCL	2-9	2-5	BR.GL, E.EB, GLBR.GL, Gleysols	Black spruce-Lodgepole pine/Tall bilberry Lodgepole pine/Labrador tea/Tall bilberry
Ov M	Mesic SiCL	0-2	5-6	Peaty Gley- sols, Mesic- sols	Black spruce/Horsetail/Sphagnum Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

On the south side of the river, pronounced groundwater flow causes open black spruce forest and dwarf birch shrubland to predominate, with lodgepole pine forest restricted in extent. Lodgepole pine forest predominates on the better drained ridge on the north side of the river, with black spruce-pine forest in small drainage courses and black spruce forest and dwarf birch shrubland in peat-filled depressions.

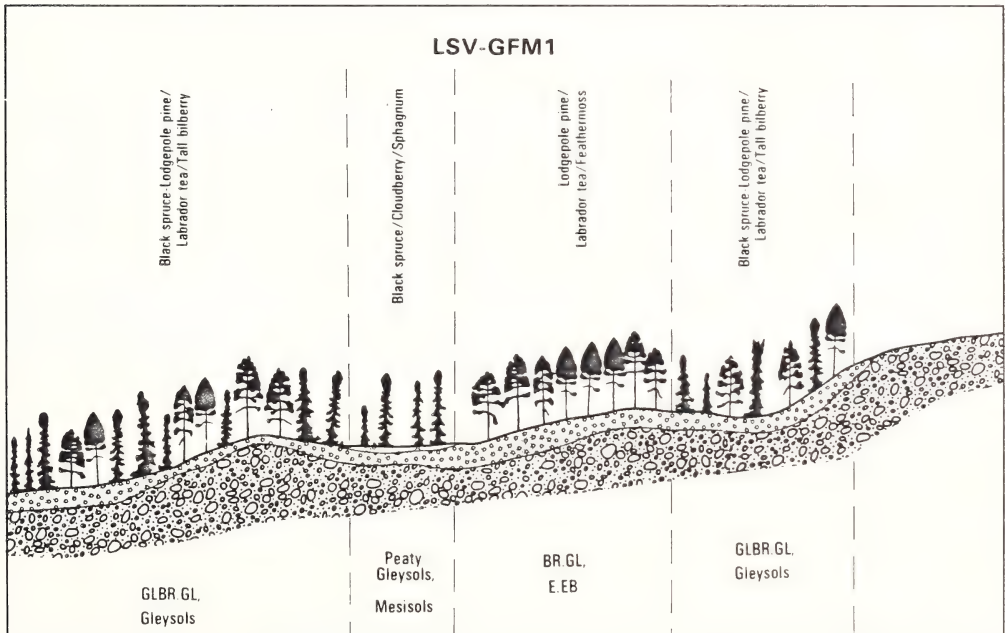


Figure 94: Schematic Diagram of Ecoregion LSV-GFM1

Physical Conditions

This system occurs adjacent to the Little Smoky River and consists of a complex of glaciofluvial and organic materials (Figure 95). Coarse-textured glaciofluvial materials are of variable thickness, and are underlain at depth by moderately fine-textured till deposits of Continental origin. The depth of these materials decreases with distance from the Little Smoky River. Organic accumulations of sphagnum peat occur in glacial meltwater channels and account for approximately 30% of surficial materials. Numerous stagnant ice features such as kames and eskers are characteristic of this landscape.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GF, GFV M	S SCL	2-25	1-3	E.EB, BR.GL	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry Lodgepole pine/Labrador tea/ Feathermoss
Ovb M	Mesic SCL	0-2	5-6	Peaty Gley- sols, Mesic- sols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

Extreme variation in soil moisture due to the combination of coarse-textured soils and pronounced groundwater movement produces a gradient of vegetation types, with open lodgepole pine forest on eskers, black spruce-lodgepole pine forest on level to gently sloping terrain, and dwarf birch shrubland in peat-filled glacial meltwater channels.

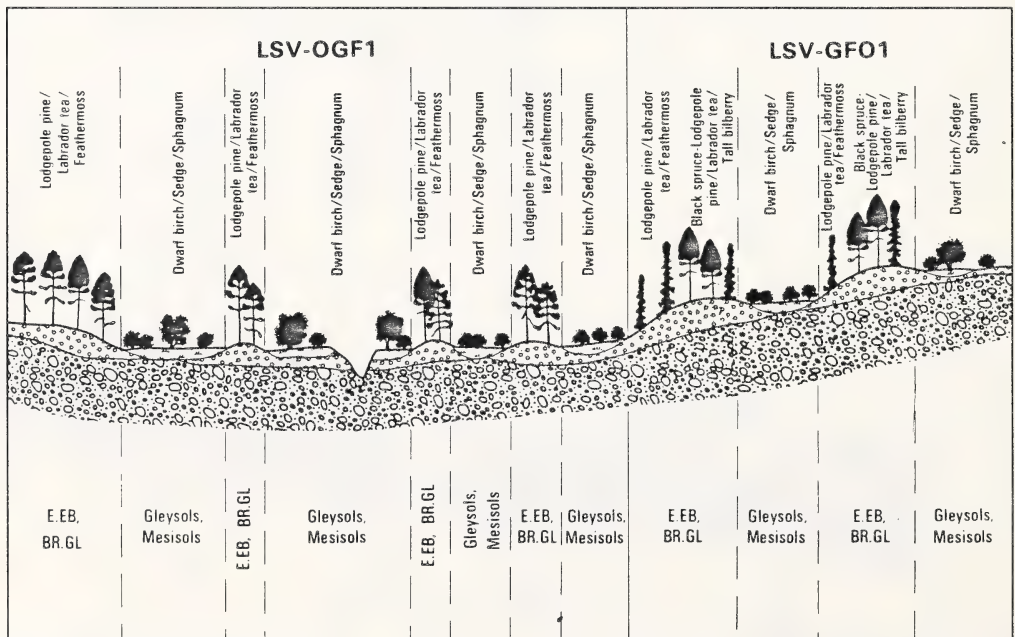


Figure 95: Schematic Diagram of Ecosections LSV-GF01 and LSV-OGF1

Physical Conditions

Found adjacent to the Little Smoky River, this system consists of a complex of thick organic accumulations and coarse-textured glaciofluvial materials (Figure 95). These materials are underlain at depth by moderately fine-textured glaciolacustrine sediments. Surface expression varies from level to hummocky.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
O, Ovb GL	Mesic SCL	0-2	5-6	Peaty Gley- sols, Mesi- sols	Dwarf birch/Sedge/Sphagnum Black spruce/Horsetail/Sphagnum
GF, GFvb GL	gS SCL	2-9	2-3	E.EB, BR.GL	Lodgepole pine/Labrador tea/ Feathermoss

Ecoregion: Boreal Uplands

Ecological Conditions

The vegetation pattern here is similar to that in the preceding ecosection. Prevailing moisture levels are somewhat higher, however, and the dominant types are black spruce forest and a mixture of dwarf birch shrublands and sedge meadows. Lodgepole pine forest occurs on drier, hummocky glaciofluvial deposits.

2.2.7 Narraway Benchlands Subregion (Ecodistrict)

This subregion, which is bisected by the Narraway River, is located in the western portion of the study area (Figure 96). The topography is gently inclined to rolling with local relief in the order of 150 m. The distinguishing characteristic of the subregion is that the landscape has not been greatly altered by post-glacial erosion by secondary streams. The underlying bedrock consists of relatively undeformed strata of the Paskapoo Formation. The presence of the Scollard Member of this formation is responsible for the occurrence of seepage within the subregion. Generally, the bedrock is masked by fluted till of Cordilleran and Continental origin.

The vegetation pattern varies from dominance by lodgepole pine and black spruce at high elevations in the Boreal Uplands and Subalpine ecoregions to a mixture of aspen, lodgepole pine and white spruce at lower elevations in the Boreal Foothills.

The occurrence of end moraine, pitted ablation till, fluting and varied glaciofluvial deposits indicate that both Cordilleran and Continental ice sheets coalesced along the northern edge of the subregion. The tills, which are of variable thickness, support lodgepole pine forest. Where organic material has accumulated, black spruce forest and some areas of dwarf birch have developed.

Colluvium is found along most of the stream valley walls and have resulted from oversteepened topography and bedrock failures. Vegetation varies due to local drainage, seepage and aspect. White spruce, black

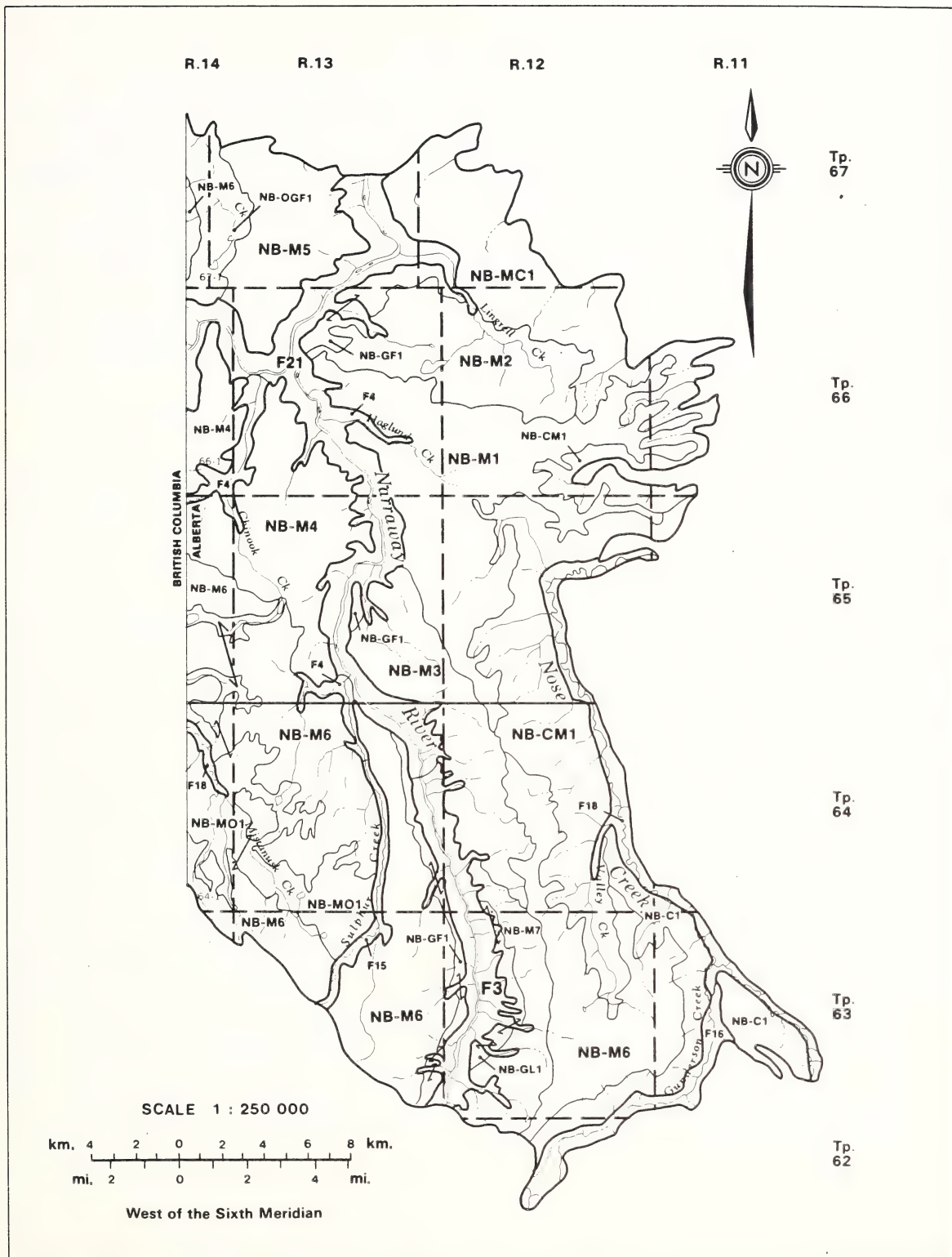


Figure 96: Narraway Benchlands Subregion (NB)

spruce, and aspen are all to be found.

The Narraway Benchlands is divided into fourteen ecosections/systems (Table 20). Generalized descriptions which reflect the complex nature of the landscape follow the table. Each of these systems/ecoséc-tions have accompanying schematic diagrams. Seven fluvial systems were identified within the subregion (F3, F4, F14, F15, F16, F18, F21). Their characteristics are discussed in Section 2.5 of Volume I of this report.

Table 20

SUMMARY OF ECOSECTIONS IN THE NARRAWAY BENCHLANDS

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
NB-C1	Steep valley walls	Medium-textured colluvium and thin till	Aspen and lodgepole pine forest
NB-CM1	Gentle to steep side slopes	Medium-textured colluvium and till	Lodgepole pine, aspen and white spruce forest
NB-GF1	Nearly level terraces	Glaciofluvial silt and sand	Lodgepole pine and black spruce-pine forest, muskeg
NB-GL1	Dissected terraces	Glaciolacustrine silt and clay, and peat	Lodgepole pine and black spruce-pine forest, muskeg
NB-M1	Plateau with end moraines	Moderately fine-textured till with sandy overlays	Lodgepole pine and black spruce-pine forest, muskeg
NB-M2	Pitted till plain	Medium-textured till and peat	Lodgepole pine and white spruce forest, muskeg
NB-M3	Fluted till plain	Moderately fine-moderately coarse-textured till	Lodgepole pine, black spruce-pine and white spruce forest
NB-M4	Gentle to steep side slopes	Moderately fine-coarse-textured till	Black spruce-lodgepole pine, white spruce and lodgepole pine forest
NB-M5	Inclined ridges	Moderately fine-textured till with sandy overlays	Lodgepole pine, aspen, white spruce and black spruce forest
NB-M6	Fluted till plain	Medium-moderately fine textured till and peat	Lodgepole pine and black spruce pine forest, muskeg
NB-M7	Gently valley sides	Medium-textured till with sandy overlays and peat	Lodgepole pine and black spruce-pine forest, muskeg
NB-MC1	Gentle to steep side slopes	Moderately fine-textured till and medium-textured colluvium	Aspen, lodgepole pine and white spruce forest
NB-MO1	Subdued valley	Moderately fine-coarse-textured till and peat	Lodgepole pine and black spruce-pine forest, shrubby muskeg
NB-OGF1	Gently undulating melt-water channel	Peat and pitted glaciofluvial sand	Muskeg, black spruce-lodgepole pine forest

Physical Conditions

These strongly to steeply sloping valley walls (Figure 97) are located adjacent to Gunderson and Nose Creeks. Surficial materials are dominantly active and inactive colluvium derived from residual sandstones. Thin morainal veneers of Continental origin are common on gentler slopes and low angle slumps occur on gentle slopes between Nose and Gunderson Creeks.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	rSL-L	31-70	1-2	O.R	Lodgepole pine/Hairy wild rye Aspen/Buffaloberry/Showy Aster
$\frac{M/Cv}{R}$	SiL-SL	16-45	2-3	O.DYB, BR.GL	Lodgepole pine/Alder/Dewberry

Ecoregion: Boreal Uplands

Ecological Conditions

Aspect has an important influence on the vegetation. Lodgepole pine forest predominates on these slopes, with stands on southern exposures having a relatively open canopy and a sparse, grassy understory. Aspen stands are found on the steepest southern exposures. White spruce stands occur in seepage tracks on all exposures.

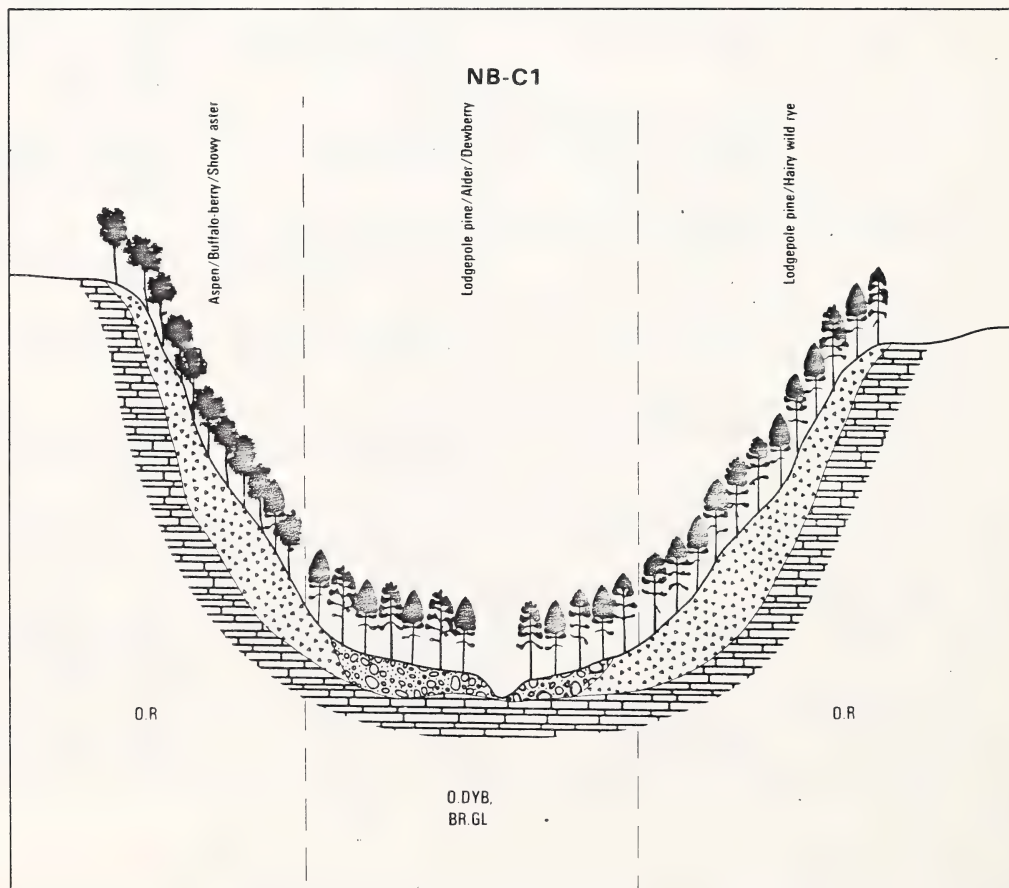


Figure 97: Schematic Diagram of Ecosection NB-C1

Physical Conditions

This system includes the gently to very strongly sloping side slopes of the Narraway Benchlands (Figure 98). It is bounded on the east by Nose Creek and on the west by a gently inclined morainal benchland (NB-M1). Colluvium derived from Cordilleran tills and weathered sandstone materials are the principal surficial materials within the area. Ground moraine is common on lower slope positions where tills are generally overlain by thin fluvial veneers derived from slope wash.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	rSiL	25-45	2	O.R, O.EB	Aspen/Buffaloberry/Showy aster Lodgepole pine/Hairy wild rye
$\frac{Cvb, Mvb}{M} \quad \frac{R}{R}$	$\frac{SiL}{rSiCL}$	6-15	2-3	O.GL, BR.GL, E.DYB	Lodgepole pine/Alder/Dewberry Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla
$\frac{Fv}{M}$	$\frac{SiL}{rSiCL}$	16-45	3-4	BR.GL, GLBR.GL	White spruce/Low-bush cranberry/ Dewberry White spruce/Feathermoss

Ecoregions: Boreal Uplands
Boreal Foothills

Ecological Conditions

Fire has had a considerable influence on the vegetation pattern in this ecosection. The upland forest is a mixture of aspen and lodgepole pine communities, with white spruce stands in seepage tracks. Much of the landscape is currently covered with seral shrublands dominated by willow and alder, however.

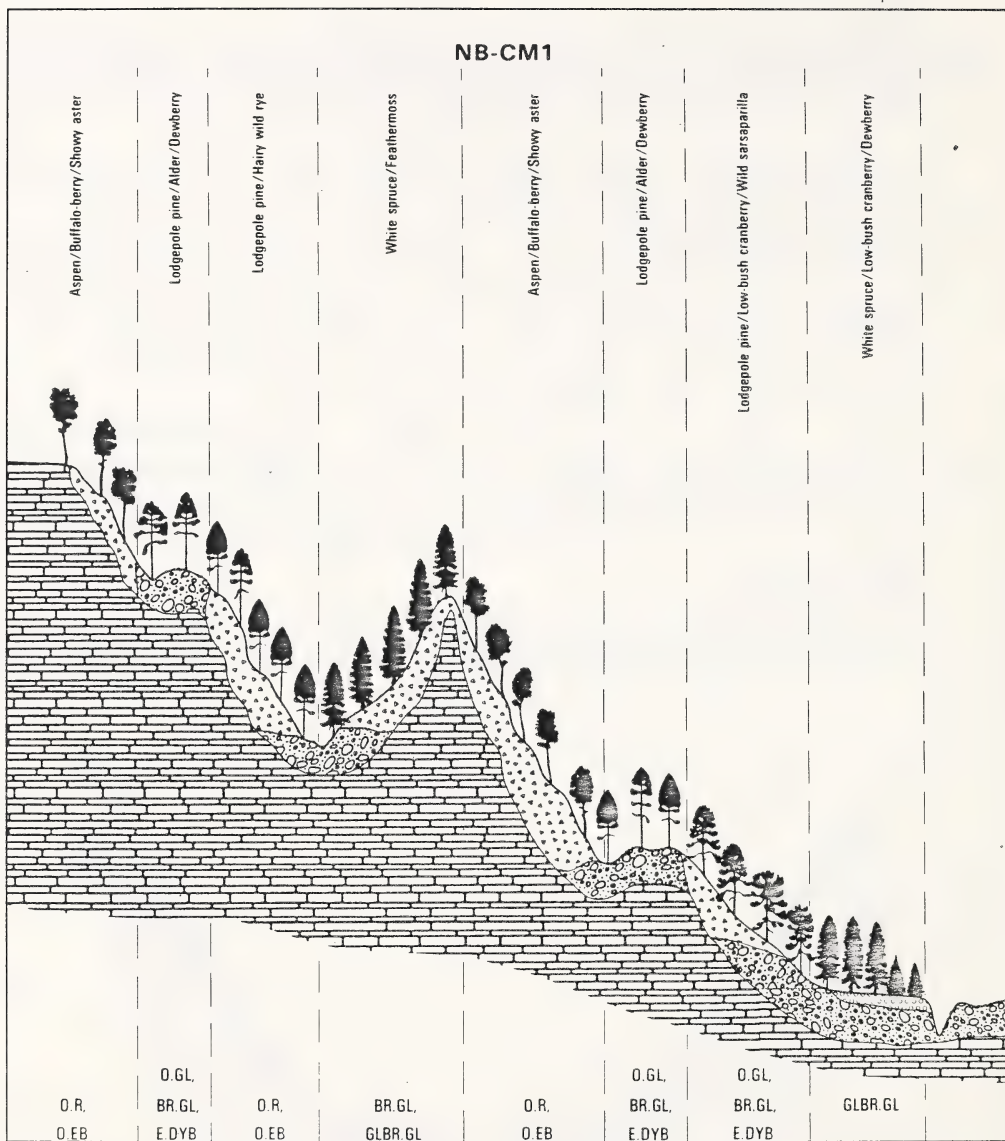


Figure 98: Schematic Diagram of Ecosection NB-CM1

Physical Conditions

This system consists of a series of level to gently inclined medium to coarse-textured glaciofluvial terraces bordering the Naraway River (Figure 99). The entire system is underlain by the morainal deposits. Discharge of groundwater from adjacent uplands causes imperfect to poor drainage conditions.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GFb M	S-Si STCL	2-15	2-3	BR.GL, E.DYB	Lodgepole pine/Labrador tea/ Feathermoss
GFv, GFv GL M	Si, Si CL STCL	0-2	4-5	GLBR.GL, Gleysols	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry
Ov M	Mesic STCL	0-2	5-6	Mesisols, Gleysols	Dwarf birch/Sedge/Sphagnum Black spruce/Horsetail/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

High soil moisture levels resulting from groundwater input and the low permeability of underlying till causes black spruce-lodgepole pine forest to predominate on these terraces, despite the relatively coarse-textured surficial materials. Drier conditions on silty ridges and along terrace edges support lodgepole pine forest. Open black spruce forest and dwarf birch shrublands are of limited extent.

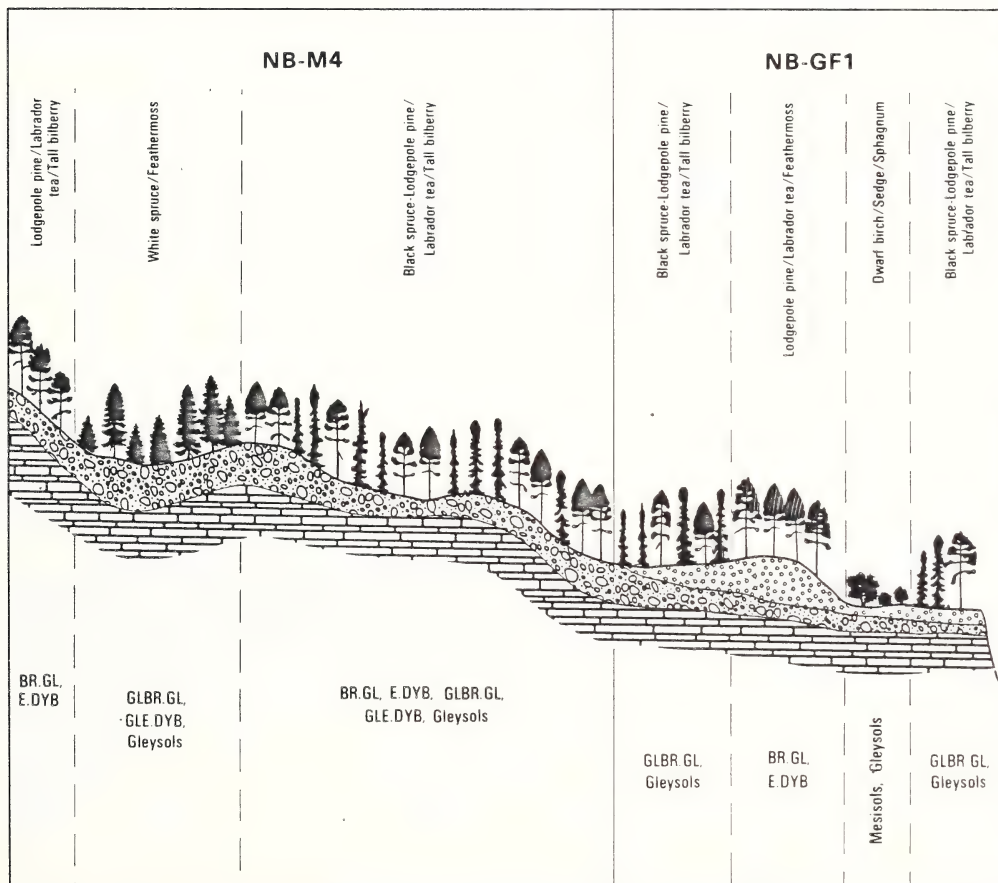


Figure 99: Schematic Diagram of Ecosections NB-GF1 and NB-M4

Physical Conditions

This dissected glaciolacustrine terrace is located immediately east of the Narraway River (Figure 100) and consists of moderately fine to fine textured sediments. Fluvial and organic veneers are common at the base of adjacent slopes (NB-M7). Surface expression is terraced to gently inclined. Moderately well drained conditions prevail over most of the landscape, except adjacent to slopes, where drainage is poor to imperfect because of groundwater discharge.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GL	CL	0-2	2-3	O.GL	Lodgepole pine/Labrador tea/ Feathermoss
Fv GL	S CL	0-2	3-4	O.GL, E.DYB, GL.GL	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry
Ov GL	Mesic CL	0-02	5-6	Peaty Gley- sols, Mesi- sols	Black spruce/Horsetail/Sphagnum Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

Young seral lodgepole pine forest predominates on most of this terrace because gullying has improved drainage of these fine-textured materials. Black spruce-pine forest occurs on the southern part of the terrace where drainage is impeded, and shrubby black spruce muskeg is found at the base of slopes where groundwater is discharged.

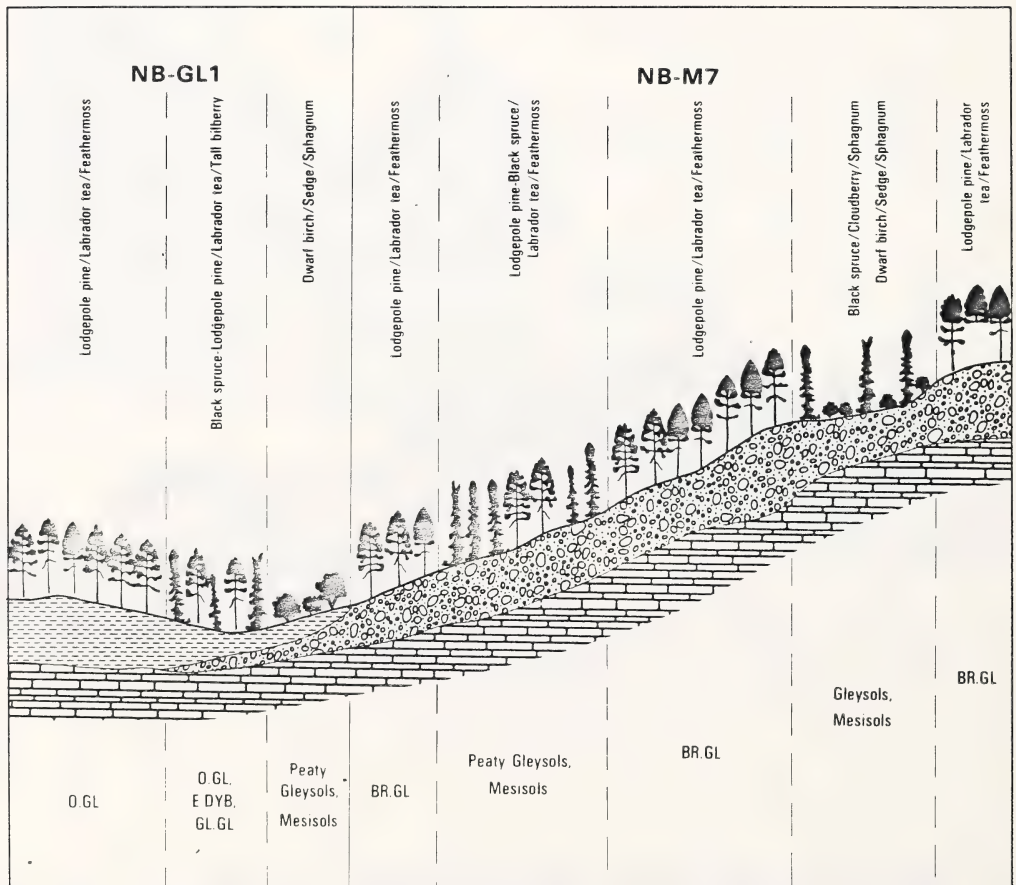


Figure 100: Schematic Diagram of Ecosections NB-GL1 and NB-M7

Physical Conditions

Located east of the Narraway River (Figure 101), this gently inclined morainal plateau is characterized by a series of distinct end moraines of Cordilleran origin which indicates that ice retreated to the south-southwest. Till deposits are generally thin throughout the system and conform to the topography of the underlying bedrock. Ridged to undulating coarse-textured glaciofluvial materials overlie till deposits in the northern portion of this ecosection adjacent to NB-M2.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	SiL-SiCL	2-9	2-5	BR.GL, GLBR.GL, Gleysols	Lodgepole pine/Alder/Labrador tea Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry White spruce/Feathermoss
$\frac{GFV}{M}$	$\frac{S}{SiCL}$	2-9	2-4	BR.GL, GLBR.GL	Lodgepole pine/Alder/Labrador tea Lodgepole pine/Labrador-Tall bilberry
$\frac{Ov}{M}$	Mesic SiCL	0-2	5-6	Peaty Gley- sols, Mesic- sols	Black spruce/Horsetail/Sphagnum Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

The predominant vegetation on this undulating terrain consists of lodgepole pine forest on elevated, well-drained ridges with thin surficial materials and black spruce-lodgepole in swales where materials are thicker and more soil moisture is available. Depressional groundwater discharge areas have a mixture of black spruce forest and open, shrubby black spruce muskeg. Extensive stands of white spruce are found on lower, north-facing slopes adjacent to NB-M2.

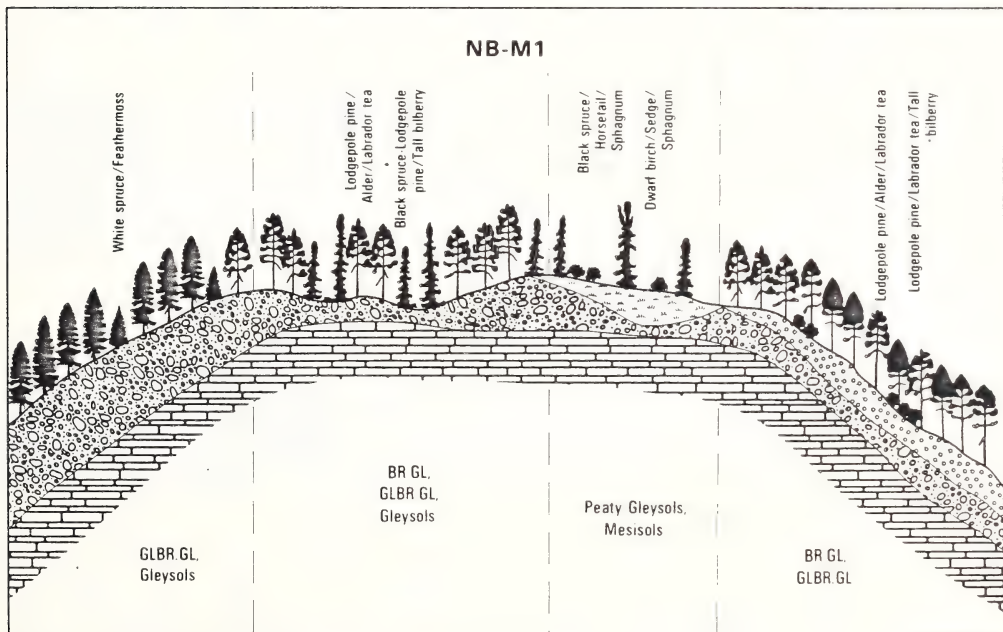


Figure 101: Schematic Diagram of Ecosection NB-M1

Physical Conditions

This basin-like hummocky till plain is centered around Lingrell Lake and consists of pitted moraine of both Cordilleran and Continental origin (Figure 102). Thin organic accumulations are scattered throughout the area especially in the upper reaches of Lingrell Creek. Local relief varies from 10-25 m and slopes range from gentle to moderate. The till fabric suggests that Cordilleran and Continental ice sheets coalesced in this area.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
M	rSiL-rSiCL	2-15	2-3	BR.GL, E.DYB	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla
			3-4	BR.GL, GLBR.GL	White spruce/Low-bush cranberry/ Dewberry
		2-5	4-5	GLBR.GL, Gleysols	White spruce/Common horsetail
Ov M	Mesic STCL	0-2	5-6	Peaty Gley- sols, Mesic- sols	Black spruce/Feathermoss Larch-Black spruce/Dwarf birch/ Sphagnum

Ecoregion: Boreal Foothills

Ecological Conditions

Lodgepole pine forest is characteristic of well-drained hummocks. The vegetation in hollows depends on depth of the water table and varies from white spruce stands to black spruce forest and dwarf birch muskeg as depth of the water table decreases. Extensive peat deposits around the headwaters of Lingrell and an unnamed creek support open black spruce and black spruce-larch muskeg.

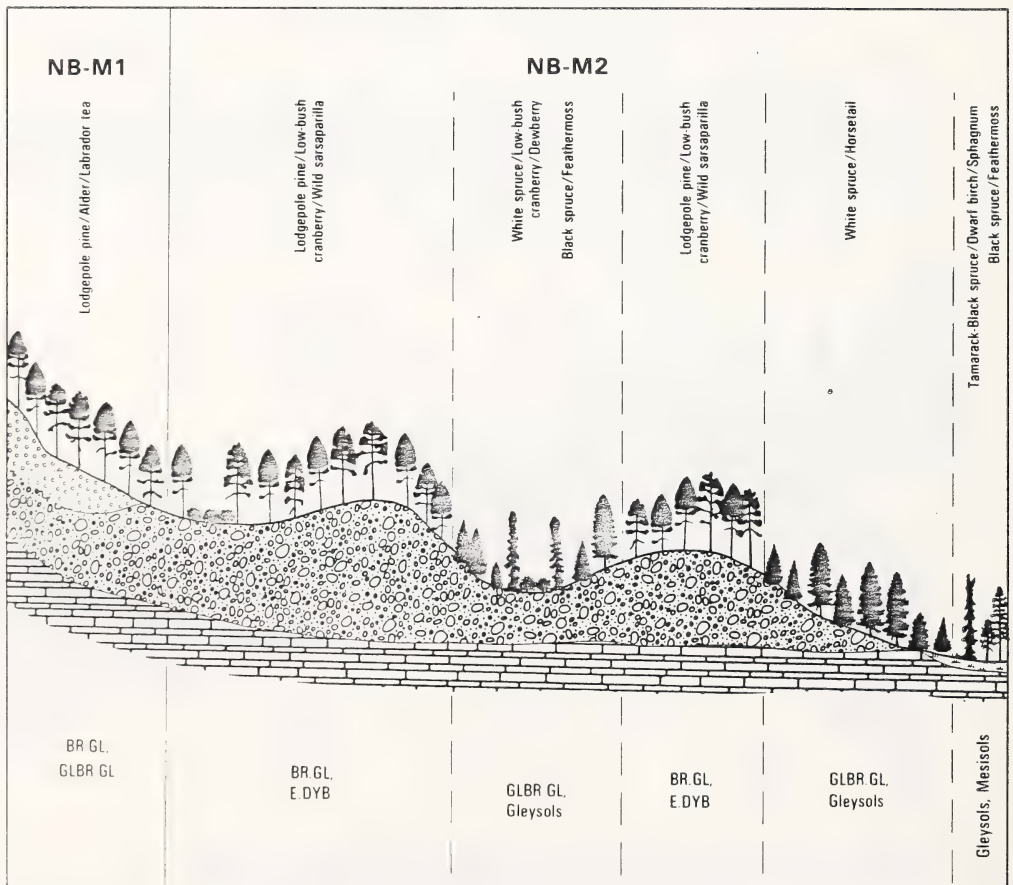


Figure 102: Schematic Diagram of Ecosections NB-M2 and NB-M1

Physical Conditions

This system abuts the east side of the Narraway River (Figure 103). Surface expression varies from gently inclined to moderately rolling and ridged, with slopes ranging from nearly level to moderate.

The dominant surficial materials are very stony Cordilleran tills of variable thickness overlying bedrock. Fluting marks suggest that ice moved across the area from south-southwest. Where tills are very thin or absent residual sandstone materials are commonly exposed. Fluvial veneers derived from slope wash are common on lower slope positions.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	rSiCL-SL	2-15	2-3	BR.GL, E.EB	Lodgepole pine/Labrador tea/ Feathermoss
$\frac{Fv}{M}$	$\frac{SL}{rSiCL}$	2-9	4-5	GLBR.GL, Gleysols	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry White spruce/Feathermoss Black spruce/Horsetail/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

A large fraction of this ecosection has been burnt and currently supports seral shrubland and lodgepole pine stands. The composition of unburned forest follows a moisture gradient, with lodgepole pine on well-drained knolls, white spruce in seepage tracks and black spruce in groundwater discharge areas on valley bottoms. Most sites are expected to regenerate to lodgepole pine forest.

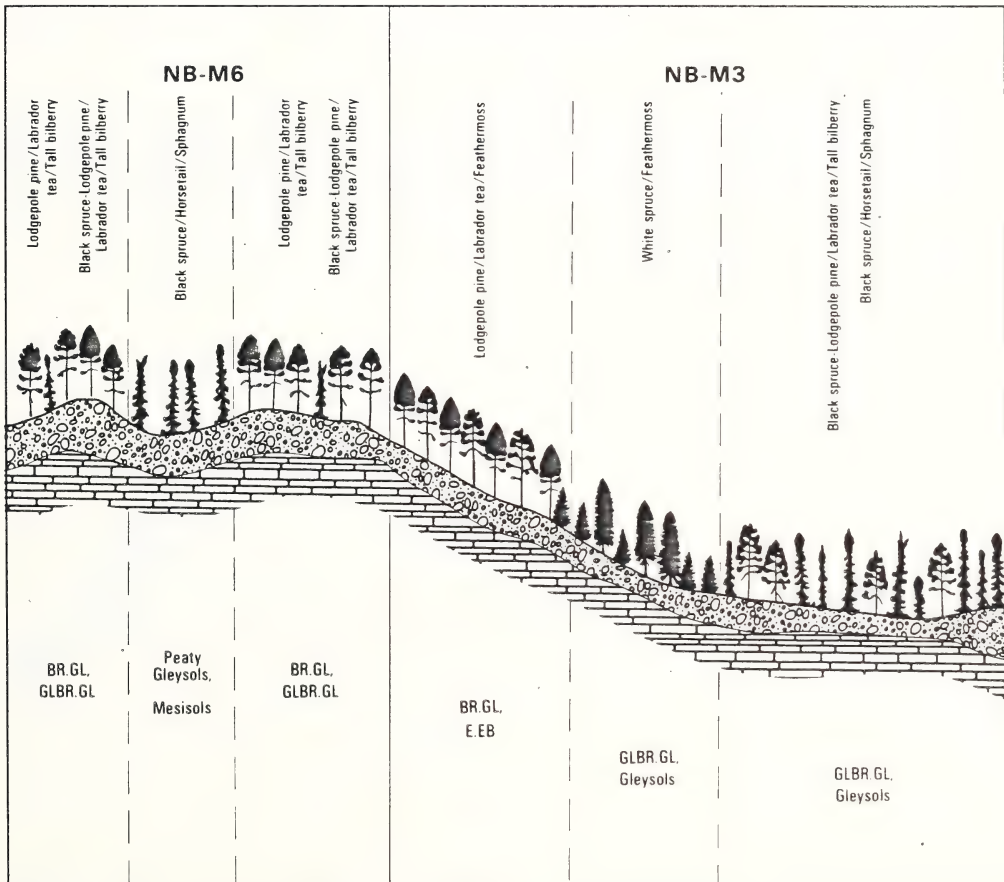


Figure 103: Schematic Diagram of Ecosections NB-M3 and NB-M6

Physical Conditions

This area on the north side of the Chinook Ridge consists of very gently to strongly sloping ground moraine comprised of very stony Cordilleran tills (Figure 99). Colluvial veneers are common on the upper slopes of Chinook Ridge while fluvial veneers derived from slope wash overlie till deposits on lower slopes.

Groundwater discharge is pronounced because of northerly dipping bedrock which is close to the surface. Seepage tracks are common on slopes and imperfectly to poorly drained conditions predominate in groundwater discharge areas at the base of slopes. Adjacent to the Narraway and Wapiti River, soils are generally well drained.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}, \frac{Fv}{R}$	$\frac{LS}{rSiCL}$	2-9	3-5	BR.GL, E.DYB, GLE.DYB, Gleysols	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry White spruce/Feathermoss
$\frac{Mvb}{R}, \frac{Cvb}{R}$	rSiCL	2-30	2-3	BR.GL, E.DYB	Lodgepole pine/Labrador tea-Tall bilberry

Ecoregion: Boreal Uplands

Ecological Conditions

Pure lodgepole pine forest is confined to well-drained knolls because of the prevalence of groundwater movement in this ecosection. White spruce forest is found on northern exposures and seepage tracks, while black spruce-pine forest occurs on lower slopes where groundwater is discharged. Deciduous shrubland occurs in recently burned areas and on peat deposits in depressional terrain.

Physical Conditions

This gently to moderately inclined, northwest trending bedrock ridge (Figure 104) occurs immediately north and west of the confluence of the Wapiti and Narraway Rivers and is dissected by a former glacial meltwater channel which is currently occupied by Hiding Creek. These bedrock ridges are overlain by moderately stony, pitted Cordilleran tills which in turn are overlain by a combination of thin glaciofluvial veneers and small eskers. The orientation of eskers suggests that Cordilleran ice moved across this area toward the northeast.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GFV M	LS STCL	2-9	3	O.GL, BR.GL	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Aspen/Low-bush cranberry/Wild sarsaparilla White spruce/Low-bush cranberry/ Dewberry
		2-5	4-5	GLBR.GL, Gleysols	Black spruce/Feathermoss

Ecoregion: Boreal Foothills

Ecological Conditions

The vegetation reflects topographically controlled variation in soil drainage. Lodgepole pine forest occurs on well-drained knolls and ridges, while gentle side slopes have a mixture of pine and aspen forest with white spruce stands in seepage tracks. Valley bottoms have a mixture of black spruce forest and shrubland.

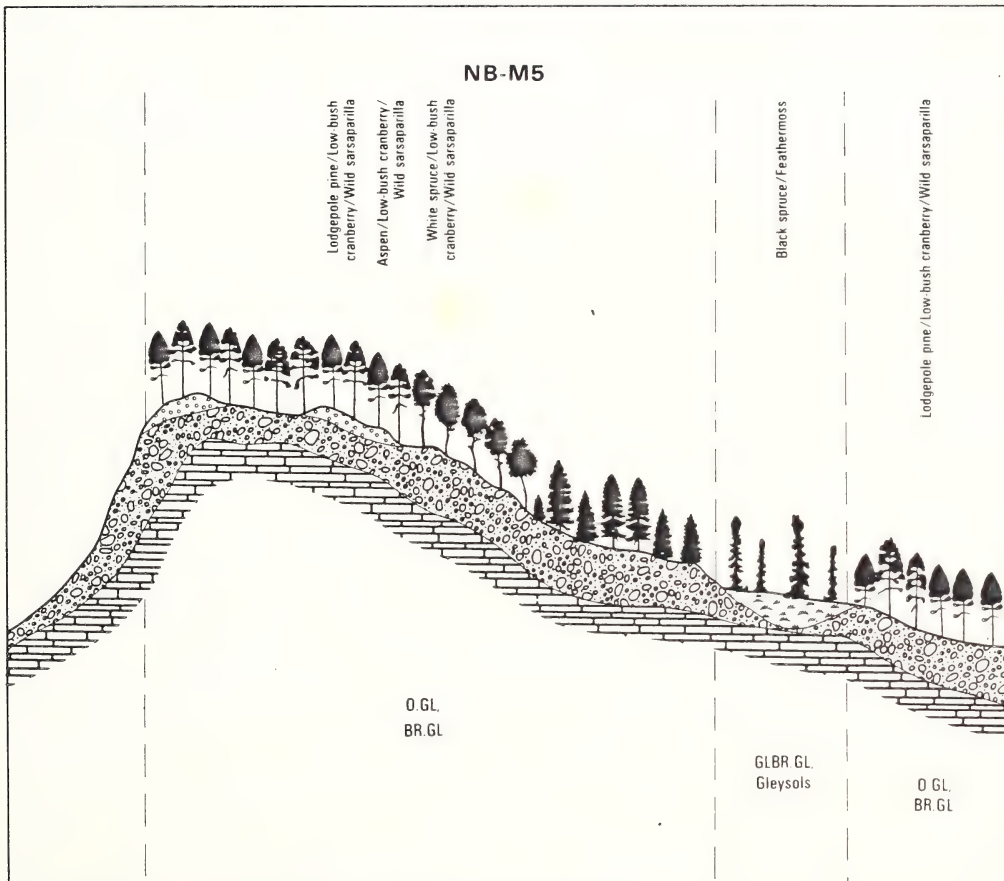


Figure 104: Schematic Diagram of Ecosection NB-M5

Ecological Conditions

This gently undulating to moderately rolling fluted till plain occurs on both sides of the Narraway River and consists of medium to moderately fine-textured Cordilleran tills of variable thicknesses (Figure 103). Small areas of hummocky moraine occur east of the Narraway River. Fluting marks are generally oriented in a north-south direction and suggest that several ice advances and retreats may have occurred across this area. Thin accumulations of sphagnum peat occur in depressional terrain and account for less than 20% of the total area.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	gL-rSiCL	2-15	2-3	BR.GL, PZ.GL	Lodgepole pine/Labrador tea-Tall bilberry
			3-4	GLBR.GL	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry
$\frac{Ov}{M}$	Mesic STCL	0-2	5-6	Peaty Gley-sols, Mesic-sols	Black spruce/Horsetail/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

Lodgepole pine forest covers about half of the ecosection on well-drained uplands, while extensive, imperfectly to poorly drained valley bottoms support black spruce-pine forest and large areas of open black spruce forest and deciduous shrubland.

Physical Conditions

Located east of the Narraway River, this system consists of medium-textured ground moraine and ablation till (Figure 100). Seepage is pronounced because of the presence of the Scollard Member in the bedrock, and imperfect to poorly drained conditions prevail with better drained conditions occurring locally on ridges. Thin fluvial veneers derived from slope wash overlie tills, especially on lower slope positions. Thin accumulations of sphagnum peat occur locally but account for less than 20% of all surficial materials.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mb, Fv R M	L, SL L	2-15	3-4	BR.GL, GLBR.GL	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry
			2-3	BR.GL	Lodgepole pine/Labrador tea-Tall bilberry
Ov M	Mesic L	0-2	5-6	Peaty Gley- soils, Mesi- soils	Black spruce/Horsetail/Sphagnum Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

An abundance of groundwater discharge causes black spruce-lodgepole pine forest to predominate in this ecosection, with open black spruce stands and deciduous shrubland found at the base of slopes where ponding occurs. Lodgepole pine forest occurs adjacent to the Narraway River where gullying has improved soil drainage.

Physical Conditions

This system includes the gently to very strongly sloping side slopes of the Narraway Benchlands (Figure 105). It encompasses the headwater valleys of Sandbar Creek and several unnamed tributary valleys to Nose Creek. Ground moraine of Cordilleran and Continental origin is the principal surficial material across the ecosection, however, inactive colluvium is commonly associated with very strongly sloping southerly aspects along Sandbar Creek. Fluvial veneers derived from slope wash are common on lower slope positions.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	rSiCL	6-30	2-3	O.GL, BR.GL	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Aspen/Low-bush cranberry/Wild sarsaparilla
$\frac{Mvb, Fv}{R \quad M}$	$\frac{SiL}{rSiCL}$	6-15	3-4	BR.GL GLBR.GL	White spruce/Low-bush cranberry/ Dewberry
$\frac{Cvb}{R}$	rSiL	16-30	2	O.R, O.EB	Aspen/Low-bush cranberry/Wild sarsaparilla Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla

Ecoregion: Boreal Foothills

Ecological Conditions

Aspect has a significant influence on the vegetation in this ecosection. Neutral exposures and relatively gentle slopes support a mixture of lodgepole pine and aspen forest, with lodgepole pine predominating. Aspen forest is more common on steep southern exposures, while white spruce forest occurs on steep northern exposures and on lower north exposures where groundwater is discharged.

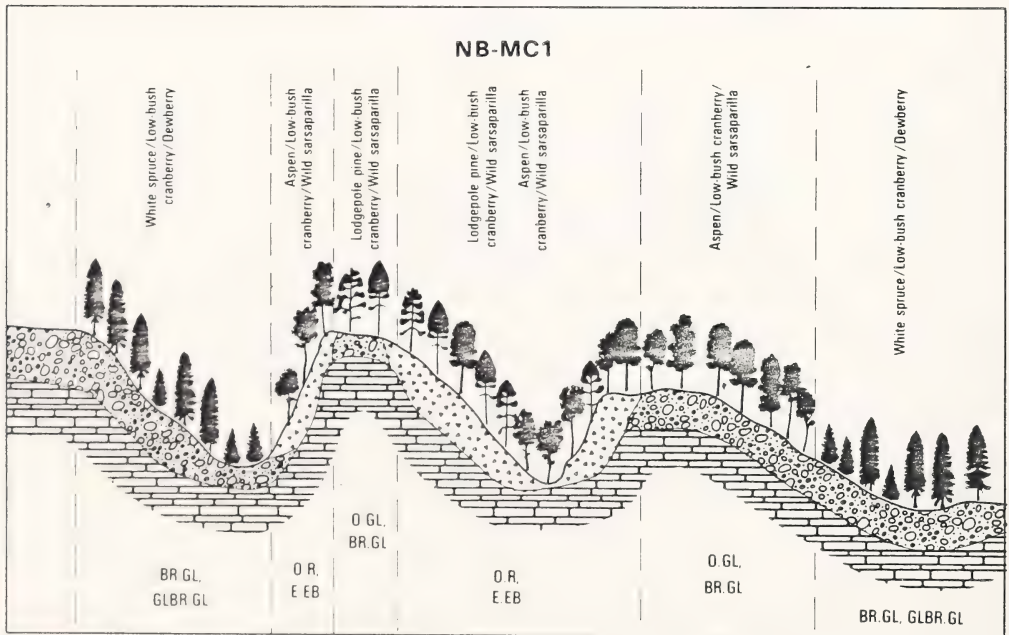


Figure 105: Schematic Diagram of Ecosection NB-MC1

Physical Conditions

This system (Figure 106) is a subdued valley occupied by Compass and Mistanusk Creeks, Sherman Lake and several smaller unnamed lakes. Subdued discontinuous bedrock ridges covered with fluted ground moraine of Cordilleran origin occur throughout this ecosection. Accumulations of sphagnum peat account for approximately 40% of all surficial materials and occur in low-lying, poorly-drained areas between ridges.

MATERIALS	TEXTURE	SLOPES	DRAINAGE	SOILS	PLANT ASSOCIATION
Ovb M	Mesic gL	0-2	5-6	Peaty Gley- sols, Mesi- sols	Dwarf birch/Sedge/Sphagnum Black spruce/Horsetail/Sphagnum
Mvb R	gL-gCL	2-15	3-4 2-3	BR.GL, GLBR.GL BR.GL	Black spruce-Lodgepole pine/ Labrador tea-Tall bilberry Lodgepole pine/Labrador tea/ Feathermoss

Ecoregion: Boreal Uplands

Ecological Conditions

Excessive soil moisture causes open black spruce muskeg and dwarf birch shrubland to cover much of this landscape. The upland forest varies from black spruce-lodgepole pine to lodgepole pine as drainage improves.

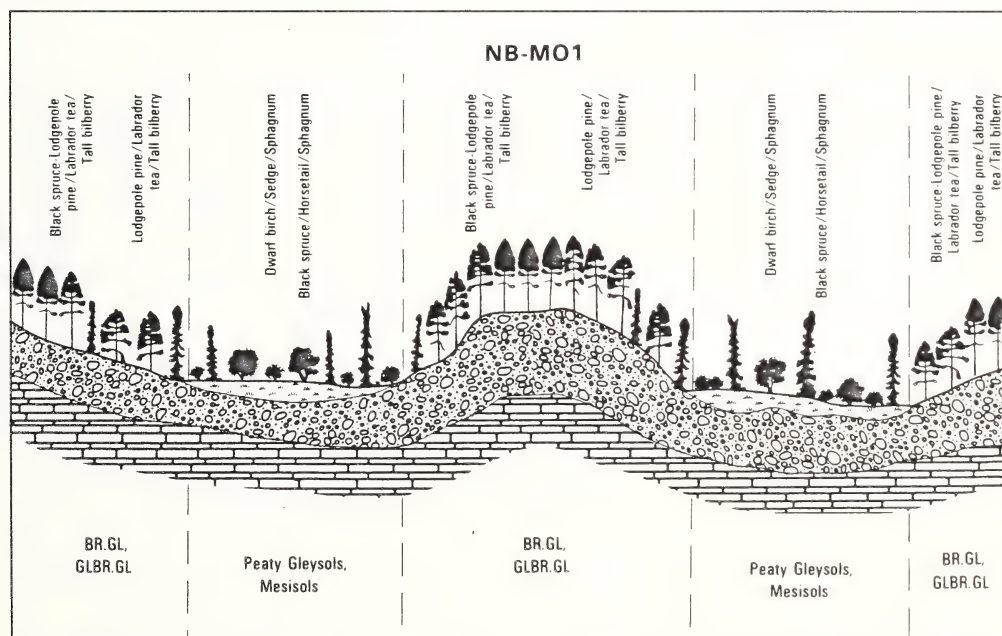


Figure 106: Schematic Diagram of Ecosection NB-MO1

Physical Conditions

This system is a level to gently undulating glacial meltwater channel drained by Hiding Creek (Figure 107). Thick accumulations of sedge and sphagnum peat account for approximately 60% of all surficial materials and numerous ponds and floating bogs occur throughout the area. Pitted glaciofluvial outwash materials occur throughout the area. The entire system is underlain at depth by a combination of moderately fine to fine-textured slowly permeable Cordilleran tills and glaciolacustrine sediments.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
0	Mesic	0	6	Mesisols	Tamarack-Black spruce/Dwarf birch/ Sphagnum
Ovb, Ovb GL M	Mesic STCL/CL	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Feathermoss
GF, GFv M/GL	S	0-2	2-4	E.EB, BR.GL	Lodgepole pine-Black spruce/ Labrador tea/Feathermoss

Ecoregion: Boreal Foothills

Ecological Conditions

High water tables cause a mixture of dwarf birch shrubland, sedge meadows and open black spruce muskeg to cover the majority of this landscape. Better drained gravel ridges support lodgepole pine and pine-black spruce forest.

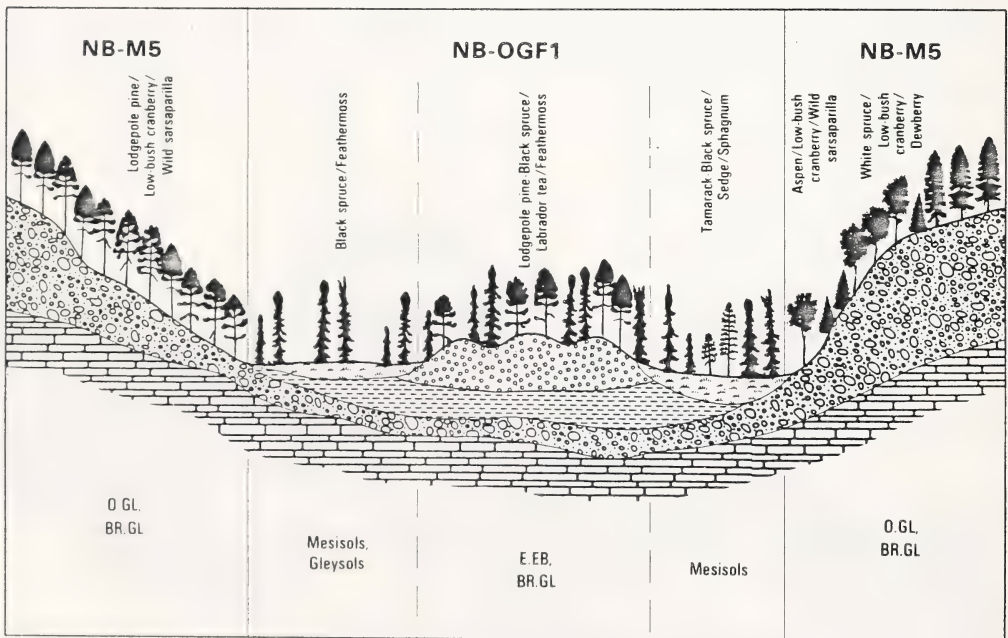


Figure 107: Schematic Diagram of Ecosystems NB-OGF1 and NB-M5

2.2.8 Simonette Benchlands Subregion (Ecodistrict)

The Simonette Benchlands consists of a rolling uplands occurring east of the Latornell River (Figure 108). This upland area, which represented part of the shoreline of the former Glacial Lake Peace, has been extensively dissected by the Moose River and tributaries of the Latornell River. The subregion is underlain mainly by gently dipping sandstone of the Paskapoo Formation. However, along the northern fringes of the uplands strata of the Wapiti Formation are often found. The subregion lies entirely with aspen forest being dominant.

Surficial materials consist chiefly of a complex of hummocky till and gently undulating ground moraine of Continental origin. Often these deposits are overlain by thin eolian materials. Vegetation consists of aspen, white spruce and lodgepole pine in association with varied wetland vegetation. Where eolian materials are found, lodgepole pine forest is predominant with aspen being of lesser significance.

The Simonette Benchlands subregion is divided into three systems/ecosections (Table 21). In addition, one fluvial system was identified (F22) and is discussed in Section 2.5 of Volume I.

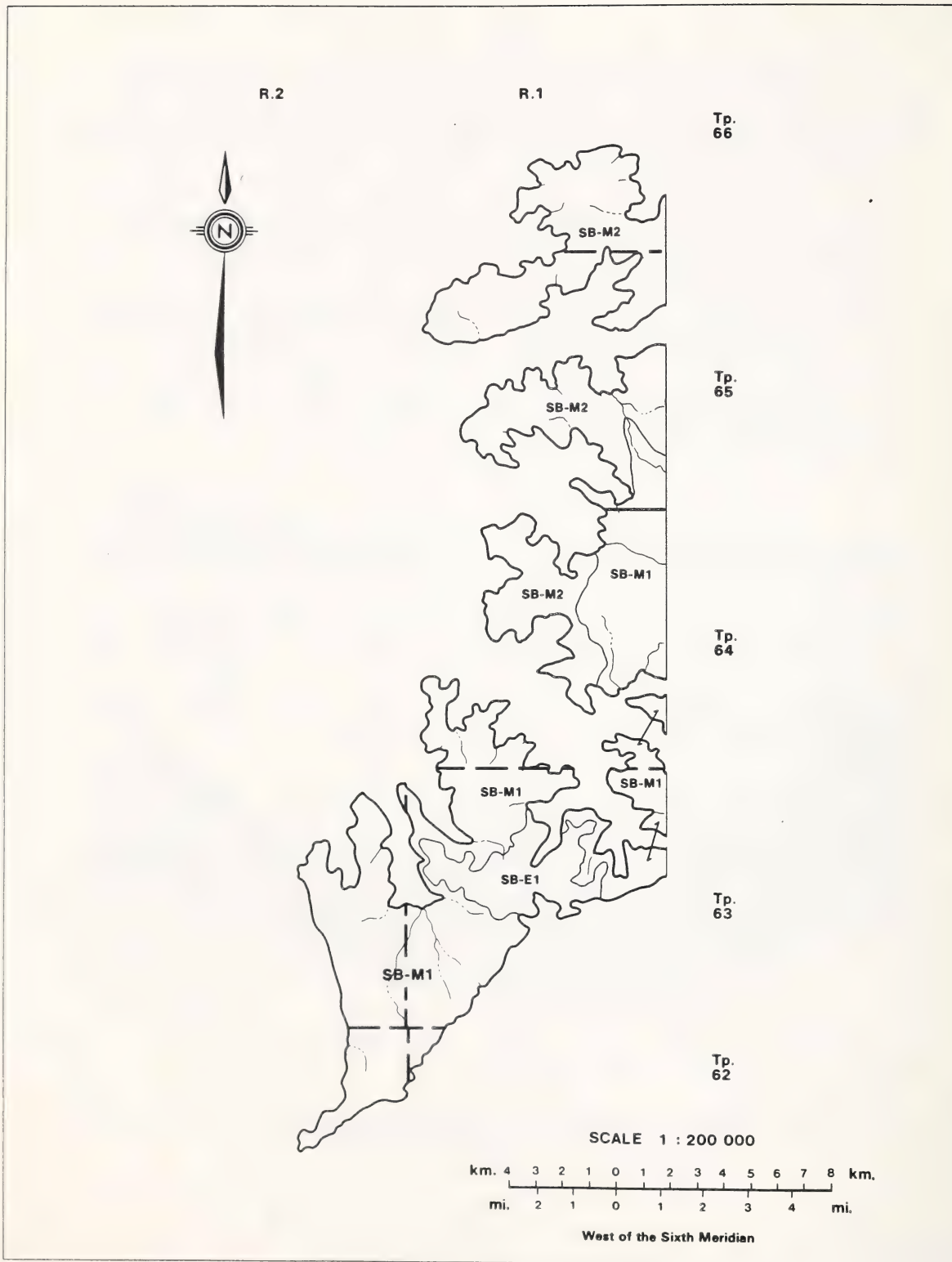


Figure 108: Simonette Benchlands Subregion (SB)

Table 21

SUMMARY OF ECOSECTIONS IN THE SIMONETTE BENCHLANDS SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
SB-E1	Undulating plateau	Eolian silt over moderately fine-textured till	Lodgepole pine and aspen forest, shrublands and muskeg
SB-M1	Rolling, hummocky upland	Eolian sand over moderately fine-textured till	Lodgepole pine and white spruce forest
SB-M2	Rolling, dissected upland	Moderately fine-textured till	Aspen and white spruce forest, deciduous shrubland

Physical Conditions:

This system occurs immediately north of the Simonette River and consists of thick undulating blankets of eolian silts with numerous subdued dune-like features (Figure 109). These deposits are underlain at depth by a combination of moderately fine to fine-textured till deposits of Continental origin and glaciolacustrine sediments. Several deep organic accumulations have developed in poorly drained depressional terrain.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
E, Eb M	Si STC	5-15	2-3	E.EB, BR.GL	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla
Ev, Ev GL M	Si STC	5-15	3-4	BR.GL, GLSZ.GL	Aspen/Low-bush cranberry/Wild sarsaparilla
Ovb GL/M	Mesic CL	0-2	5-6	Peaty Gley- sols, Mesi- sols	Tamarack-Black spruce/Dwarf birch/Sphagnum

Ecoregion: Boreal Foothills

Ecological Conditions

Variation in the depth of loess deposits and in availability of soil moisture determines the vegetation pattern. Lodgepole pine forest occurs on deep, well-drained silt deposits, while aspen forest is found on thinner deposits where underlying till holds water close to the surface. The vegetation in low-lying areas ranges from a mixture of willow, paper birch and reedgrass in subdued depressions to dwarf birch shrublands with scattered black spruce in larger areas where organic soils have developed.

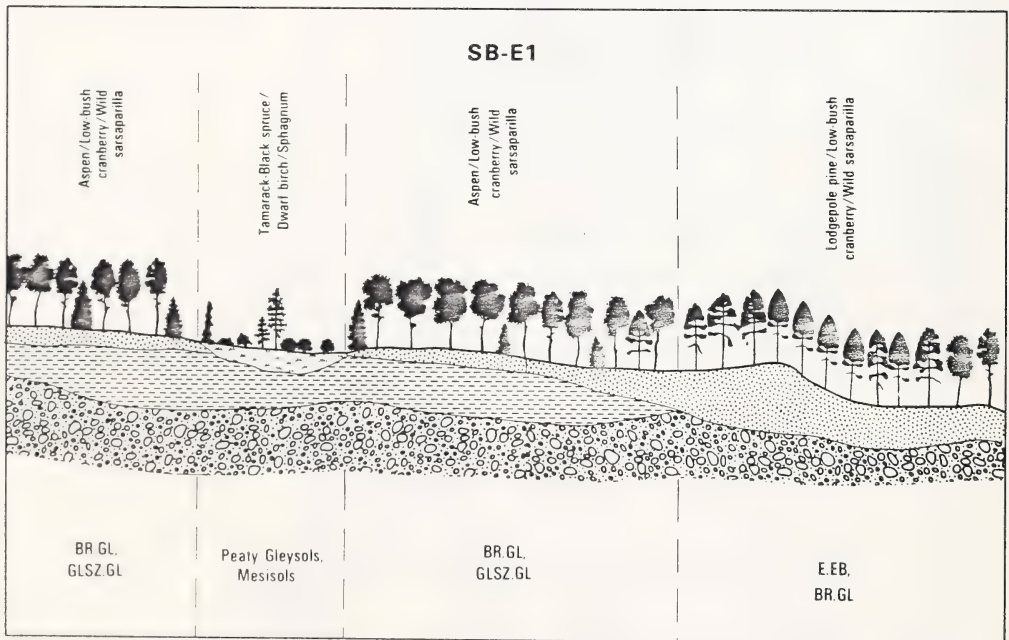


Figure 109: Schematic Diagram of Ecosection SB-E1

Physical Conditions:

This is a rolling upland area of hummocky moraine on the eastern edge of the study area (Figure 110). Moderately fine-textured till deposits of Continental origin are overlain by veneers of aeolian sands. This creates a pattern of drainage conditions that vary from well on hummocks to imperfect in hollows.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Ev M	S-LS STCL	2-15	2-4	BR.GL	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla White spruce/Low-bush cranberry/ Dewberry

Ecoregion: Boreal Foothills

Ecological Conditions

The vegetation pattern is produced by differences in the thickness of eolian deposits and availability of soil moisture, along with relatively recent fires. Eolian deposits are thin and fires have not occurred recently in the western portion of the ecosection. The predominant vegetation is white spruce forest with a significant component of balsam poplar. Large portions of this forest were harvested in the past, and remaining stands are overmature.

Eolian deposits are thicker, the terrain is more hummocky and fires have been wide-spread in the eastern part of the ecosection. Young seral pine forest occurs on hummocks, while hollows support dense shrubland of willow and reedgrass in which young white spruce have established.

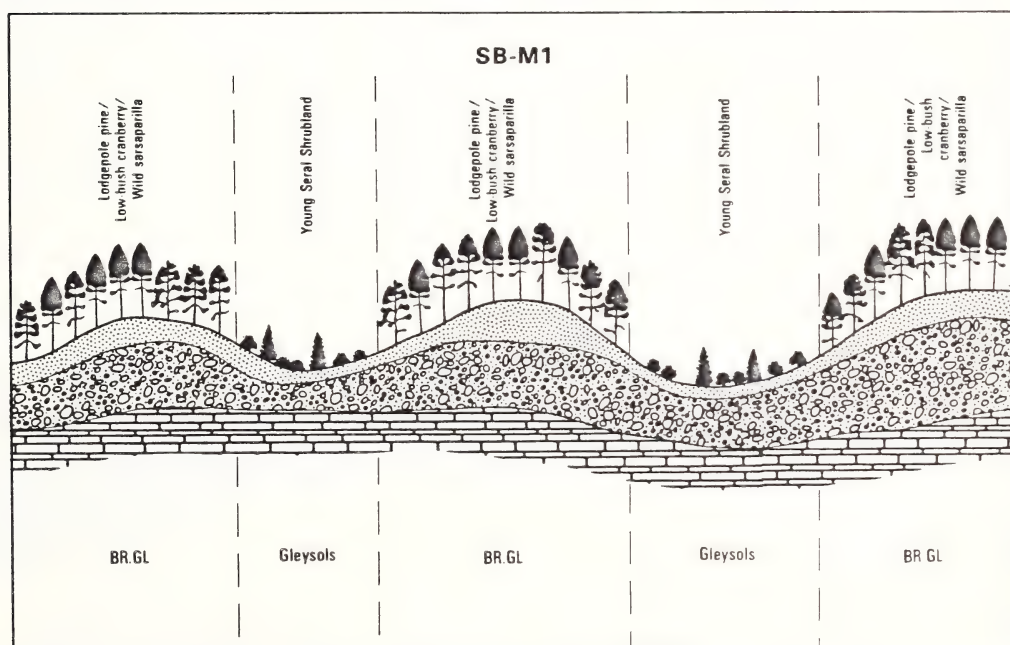


Figure 110: Schematic Diagram of Ecosection SB-M1

Physical Conditions

This is an undulating to rolling dissected upland area covered with Continental till (Figure 111). Moderately stony, moderately fine-textured Continental till is often overlain by sandy glaciofluvial veneers on lower slope positions.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
M	SiCL	2-15	2-3	O.GL, BR.GL	Aspen/Low-bush cranberry/Wild sarsaparilla
			4	GL.GL	White spruce/Low-bush cranberry/Dewberry
GFv M	SL SiCL	2-9	3-4	BR.GL, GLBR.GL	White spruce/Low-bush cranberry/Dewberry Aspen/Low-bush cranberry/Wild sarsaparilla

Ecoregion: Boreal Foothills

Ecological Conditions

The vegetation pattern is topographically controlled. Aspen forest occurs on relatively well-drained uplands with willow-paper birch shrubland in low-lying areas. White spruce stands are common on slopes, especially gentle northern exposures receiving seepage water. A few stands of lodgepole pine forest occur on sandy deposits on lower slopes, but the relative lack of lodgepole pine distinguishes this from other ecosections in the subregion.

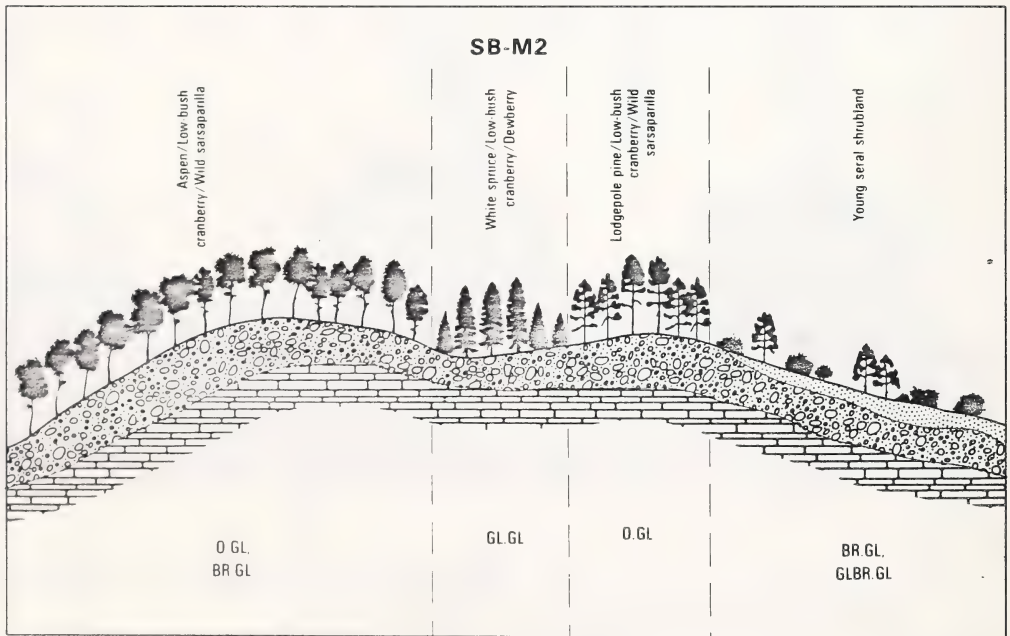


Figure 111: Schematic Diagram of Ecosection SB-M2

2.2.9 Simonette Uplands Subregion (Ecodistrict)

The Simonette Uplands occurs east of the Smoky River valley (Figure 112) . The subregion consists of a series of rolling to flat-topped plateau remnants that have been extensively dissected by the tributaries of both the Simonette and Latournell Rivers.

The subregion is underlain by bedrock of the Paskapoo Formation, with minor occurrences of pre-glacial gravels (Tertiary) being found overlying bedrock on the remnant plateau tops. The principal surficial materials consist of a complex of Continental tills and residuum, with till thickness decreasing from north to south. Colluvium derived from weathered bedrock, pre-glacial gravels and till deposits is common throughout the subregion.

This subregion extends from the Boreal Foothills ecoregion in the north to the Subalpine ecoregion along the southern fringes of the plateau remnants. The Boreal Foothills are typified by a mixture of aspen, lodgepole pine and white spruce forest. Closed lodgepole pine forests, typical of the Boreal Uplands and Subalpine ecoregions, occur at higher elevations, the latter occurring above 1 280 m. Within the Subalpine, significant amounts of black spruce can be found on wet sites.

The Simonette Uplands has been divided into eleven systems/ecosections (Table 22). These are described in generalized terms with accompanying schematic diagrams. Three fluvial systems are identified (F22, F26, F27) within the subregion and are discussed in Section 2.5 of Volume I.

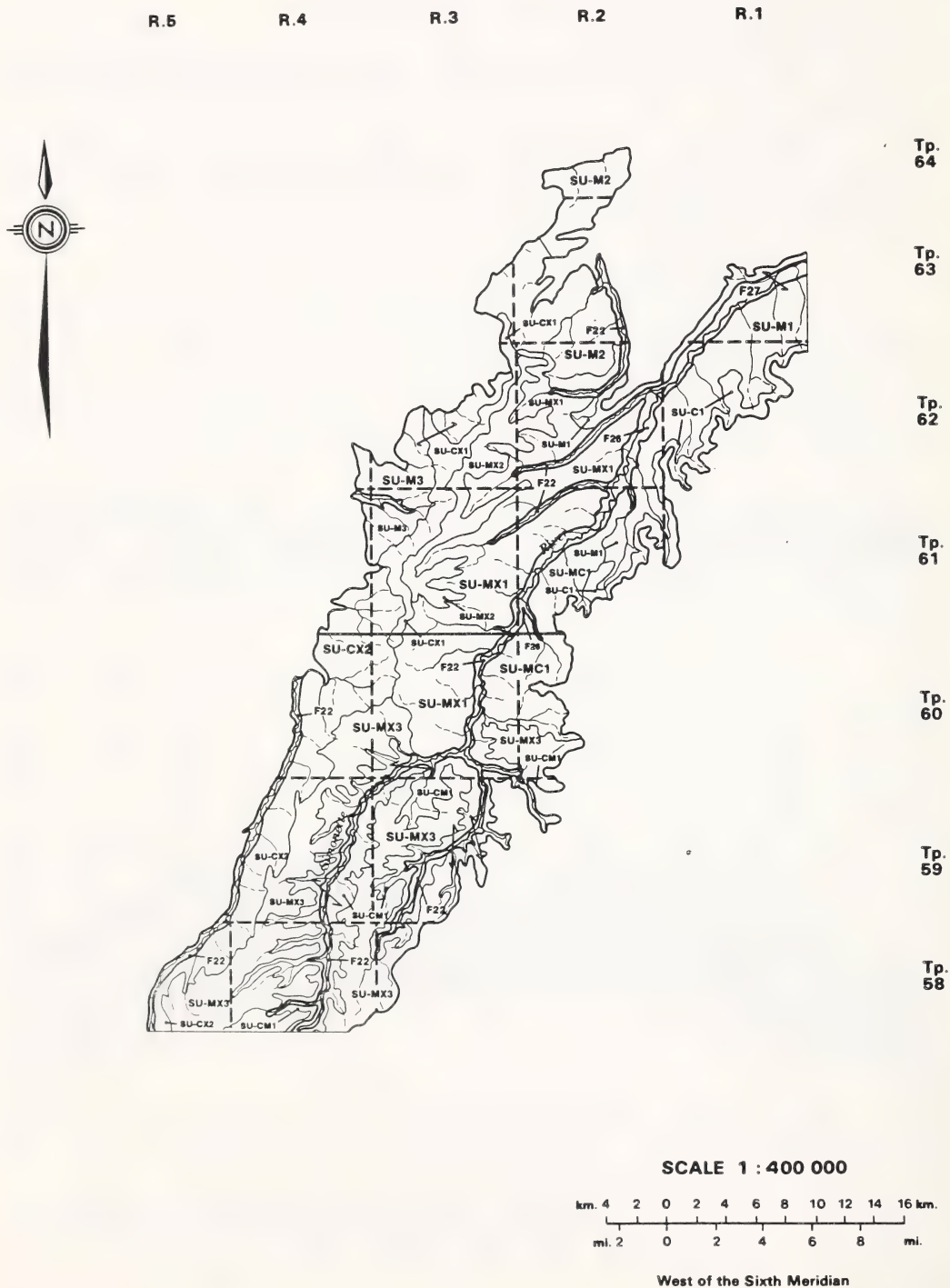


Figure 112: Simonette Uplands Subregion (SU)

Table 22

SUMMARY OF ECOSECTIONS IN THE SIMONETTE UPLANDS SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
SU-C1	Steep, gullied valley walls	Coarse-textured colluvium	Lodgepole pine, aspen and white spruce forest
SU-CM1	Gentle to steep headwater valleys	Moderately fine-textured colluvium and till	Lodgepole pine and white spruce forest
SU-CX1	Extreme, gullied and slumped slopes	Thin medium-textured colluvium and residual sandstone	Aspen, white spruce and lodgepole pine forest
SU-CX2	Steep, ridged and gullied slopes	Medium-textured colluvium, residual materials and till	Lodgepole pine and white spruce forest
SU-M1	Gentle to steep slopes and plateau remnants	Medium-textured till	Aspen, white spruce and lodgepole pine forest
SU-M2	Gentle to steep headwater valleys	Medium to moderately fine-textured till	Aspen, white spruce and lodgepole pine forests
SU-M3	Highly dissected gentle to steep slopes	Moderately fine-textured till	White spruce, aspen and lodgepole pine forest
SU-MC1	Steeply sloping walls of headwater valleys	Medium-textured till and colluvium	Lodgepole pine and white spruce forest
SU-MX1	Dissected, gentle to steep headwater valleys	Thin medium-textured till and residual sandstone	Lodgepole pine and white spruce forest
SU-MX2	Undulating plateau remnants	Thin, medium-textured till and residual sandstone	Lodgepole pine forest
SU-MX3	Rolling plateau remnants	Medium-textured till and weathered residual sandstone	Lodgepole pine and black spruce-pine forest

Physical Conditions:

Located east of the Simonette River adjacent to the Deep Valley Plateau, this system consists of gullied side slopes with relatively thin colluvial materials overlying moderate to very strongly inclined bedrock (Figure 113). These materials are very stony and are comprised of a mixture of Continental tills, preglacial gravels and unconsolidated bedrock materials. Colluvial materials tend to be somewhat thicker on lower slope positions where groundwater seepage is common. Pronounced groundwater discharge from the adjacent Deep Valley plateau combined with the steepness of the topography has resulted in gullying and slumping along lower slopes, generally in areas where vegetation cover has been removed.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cv}{R}$	gSL	31-45	2-3	O.R., O.EB, BR.GL	Lodgepole pine/Alder/Dewberry Lodgepole pine/Twisted stalk/ Feathermoss Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla
$\frac{Cb}{R}$	gSL	16-30	2-4	E.EB, BR.GL, GLCU.R	Lodgepole pine/Alder/Labrador tea Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla White spruce/Feathermoss Aspen/Low-bush cranberry/Wild sarsaparilla

Ecoregion: Boreal Uplands
Boreal Foothills

Ecological Conditions

Aspect and fire have significant influences on the vegetation pattern in this ecosection. A mixture of white spruce and lodgepole pine forest occurs on northern exposures in the northern part of the ecosection, where seepage is also a factor. Western exposures are steeper and drier, and fires have occurred as well. These slopes support a mixture of aspen and lodgepole pine forest.

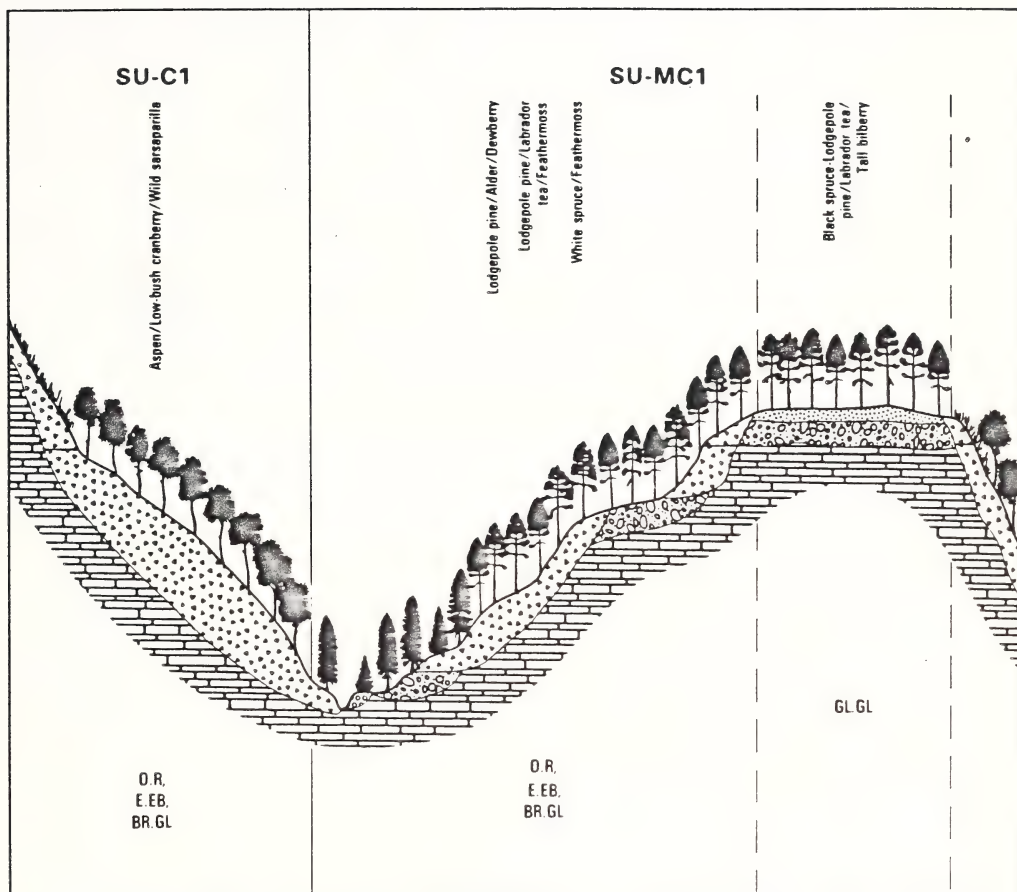


Figure 113: Schematic Diagram of Ecosections SU-C1 and SU-MC1

Physical Conditions:

These gently to strongly sloping headwater valley walls of the Simonette River (Figure 114) consist of a complex of colluvium and till deposits of variable thicknesses overlying bedrock. Colluvial materials derived from eroded till deposits and residual sandstone materials are common on upper slope positions where slope failure and gullying are common. Lower slope positions are mantled with Continental tills which are commonly overlain by slope wash.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	kSiL-kSL	16-30	2-3	O.R, E.DYB, BR.GL	Lodgepole pine/Twisted stalk/ Feathermoss
$\frac{Mvb, Cvb}{R \quad R}$	SiL-SiCL	6-15	2-3	BR.GL, E.DYB	Lodgepole pine/Labrador tea/ Feathermoss White spruce/Feathermoss

Ecoregion: Boreal Uplands

Ecological Conditions

The vegetation in this ecosection reflects the regional climate, with lodgepole pine forest predominating on a wide range of slopes and exposures. A few stands of white spruce are found along seepage tracks, especially on northern exposures. The lack of aspen compared to SU-C1 is a reflection of higher elevation in this ecosection.

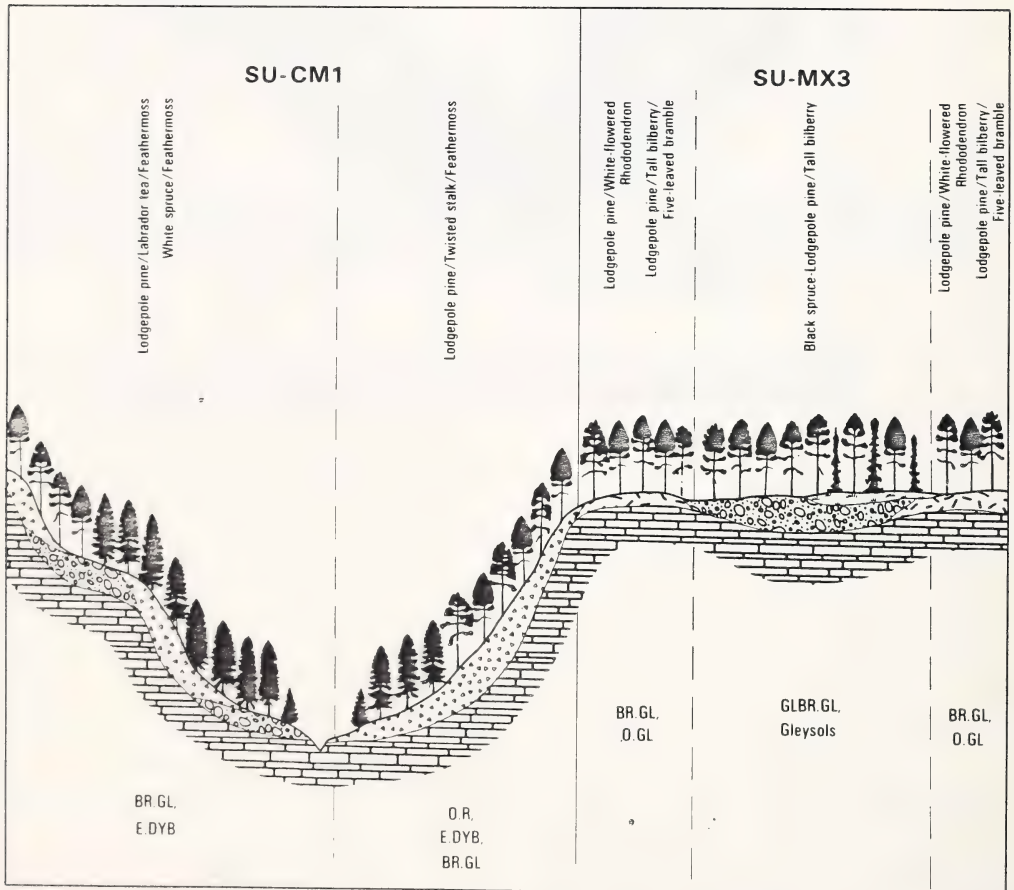


Figure 114: Schematic Diagram of Ecosections SU-CM1 and SU-MX3

Physical Conditions:

Found along the western edge of a plateau remnant (SU-MX2), this strongly to extremely sloping system (Figure 115) consists of thin colluvial materials and residuum overlying bedrock. Colluvium is the principal surficial material and is derived from weathered sandstone and mudstones. Residual materials are common on ridge tops and sloping topography where both tills and colluvial materials have been washed away. Much of this system is prone to bedrock failure and slumping.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cv}{R}$	S1L-SL	16-70	1-2	O.R, O.DYB, E.DYB	Aspen/Buffaloberry/Showy Aster Aspen/Low-bush cranberry/Wild sarsaparilla White spruce/Low-bush cranberry/ Dewberry
$\frac{Xv}{R}$	SL	6-70	2-3	E.DYB, BR.GL	Lodgepole pine/Alder/Dewberry Seral shrubland

Ecoregions: Boreal Upland
Boreal Foothills

Ecological Conditions

Exposure and seepage are the major ecological influences in this ecosection. Aspen forest is found on steep, south-facing slopes, while neutral exposures support a mixture of lodgepole pine and white spruce forest. White spruce stands are common in seepage tracks on lower slopes, while seral shrubland is found on dry, unstable upper slopes.

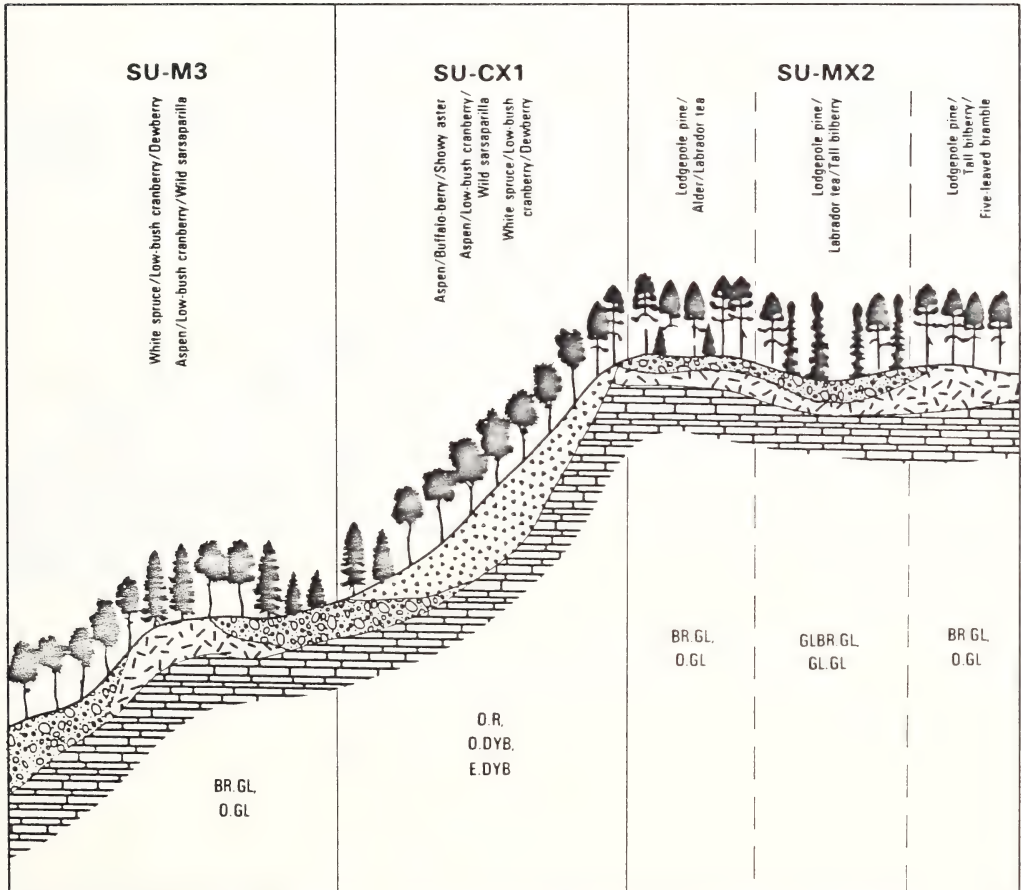


Figure 115: Schematic Diagram of Ecosections SU-CX1, SU-MX2 and SU-M3

Physical Conditions:

This system (Figure 116) includes the steep ridged and gullied slopes along the eastern side of Bolton Creek valley. Colluvium is the principal surficial material with significant amounts of residual mudstones mixed with Continental tills. Slumping and gullyng of unconsolidated mudstones is enhanced by the high rates of groundwater movement.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cu, Xv}{R}$	SiCL-kSiL	31-70	2-3	O.R, E.DYB, BR.GL	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/Alder/Dewberry Lodgepole pine/Twisted stalk/ Feathermoss Lodgepole pine/Hairy wild rye White spruce/Feathermoss
$\frac{Mvb}{R}$	SiCL-SiL	16-30	3-5	BR.GL, GLBR.GL, Gleysols	White spruce/Feathermoss Lodgepole pine/Labrador tea/ Feathermoss

Ecoregion: Subalpine
Boreal Uplands

Ecological Conditions

Groundwater seepage and the increasing thickness of surficial materials causes white spruce forest to predominate on lower slopes, especially in subdued gullies. Subdued ridges and drier upper slopes support lodgepole pine forest, with a dense alder understory characteristics of these forests in seepage tracks

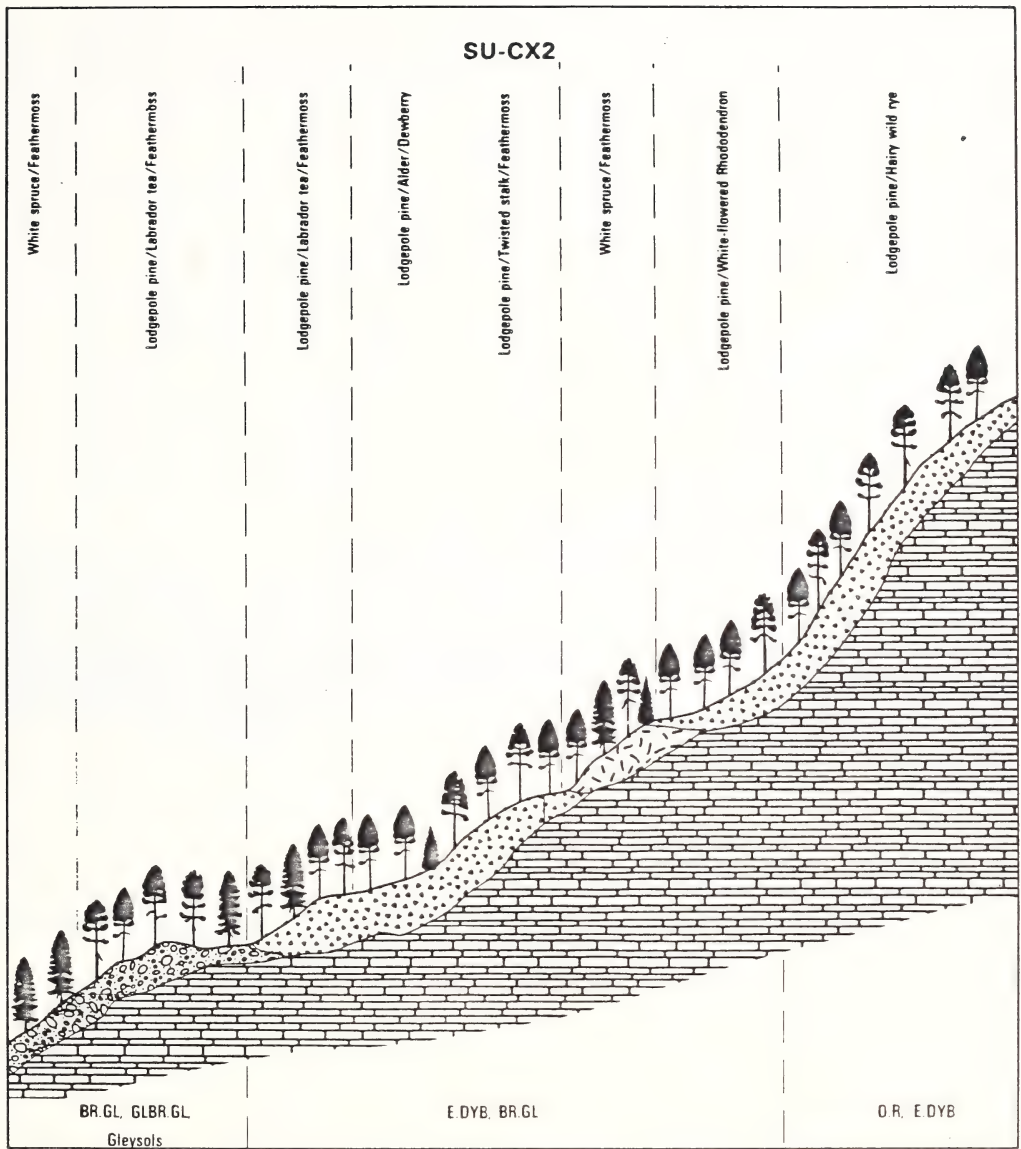


Figure 116: Schematic Diagram of Ecosection SU-CX2

Physical Conditions:

Occurring adjacent to the Simonette River This system consists of till deposits of Continental origin overlying gently to very strongly sloping bedrock (Figure 117). Surficial materials are of variable thickness and are commonly overlain by thin fluvial veneers on lower slope positions. Thin colluvial veneers overlie bedrock in several north-trending stream valleys. Pronounced surface runoff from upper slope positions has resulted in extensive gullying.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
M, $\frac{Mvb}{R}$	kSiL-kL	6-30	2-3	O.GL, BR.GL	Aspen/Low-bush cranberry/Wild sarsaparilla White spruce/Low-bush cranberry/ Dewberry Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla
$\frac{Cv}{R}$	kSiL-kL	16-45	2-3	O.R, BR.GL	Aspen/Low-bush cranberry/Wild sarsaparilla White spruce/Low-bush cranberry/ Dewberry Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla

Ecoregion: Boreal Foothills

Ecological Conditions

Variation in aspect and topography influences the vegetation pattern. Aspen forest predominates on dry, steep southern exposures and on ridges produced by extensive gullying in the southern part of the ecosection. Topography is not as extreme in the northern part of the ecosection. A mixture of aspen and white spruce forest is found on the west side of the Simonette River, while lodgepole pine and white spruce forest occurs on the opposite side of the river where northern aspects predominate and there is substantial groundwater seepage from the Deep Valley Plateau.

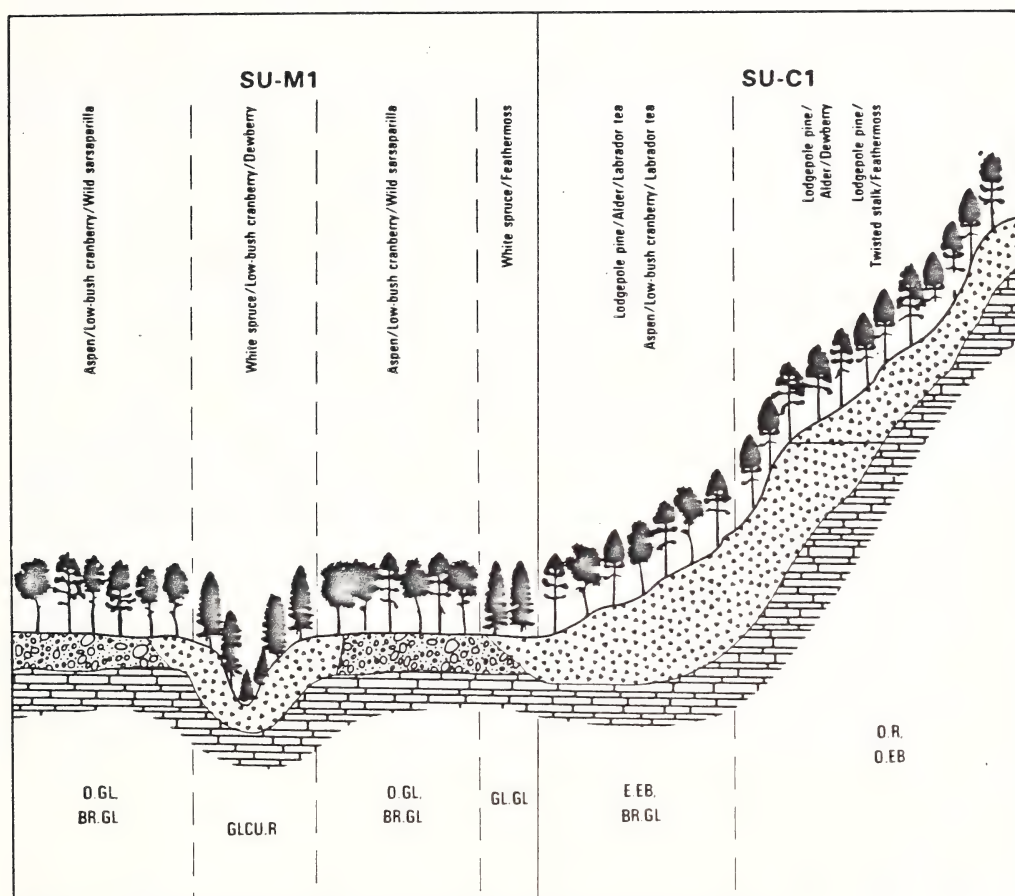


Figure 117: Schematic Diagram of Ecosystems SU-M1 and SU-C1

Physical Conditions:

This system (Figure 118) consists of the highly dissected plateau remnants and headwater valleys of the Latonnell River. Surficial materials consist of Continental tills of variable thicknesses which are commonly overlain by thin glaciofluvial veneers. Much of the system has been heavily dissected by post-glacial streams resulting in an inclined to strongly ridged surface expression.

MATERIAL	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
M	SiL-CL	16-30	2-3	O.GL, BR.GL	Aspen/Low-bush cranberry/Wild sarsaparilla Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla
			4	GL.GL	White spruce/Low-bush cranberry/ Dewberry
$\frac{GFv}{M}$	$\frac{S}{STCL}$	6-15	2-3	E.EB, BR.GL	Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Aspen/Low-bush cranberry/Wild sarsaparilla

Ecoregion: Boreal Foothills

Ecological Conditions

Recurrent fires in the northern part of this ecosection have produced a characteristic pattern of aspen forest on plateau remnants and upper slopes, and a mixture of aspen and white spruce forest on lower slopes where seepage tracks are numerous. Recently burnt areas currently support dense shrubland dominated by willow and alder, reflecting the wide-spread incidence of seepage. The few lodgepole pine stands in this portion of the area are confined to thick glaciofluvial deposits on slopes.

Lodgepole pine forest covers several ridges in the southern part of the area. The occurrence of these nearly pure stands may reflect a lower frequency of fires.

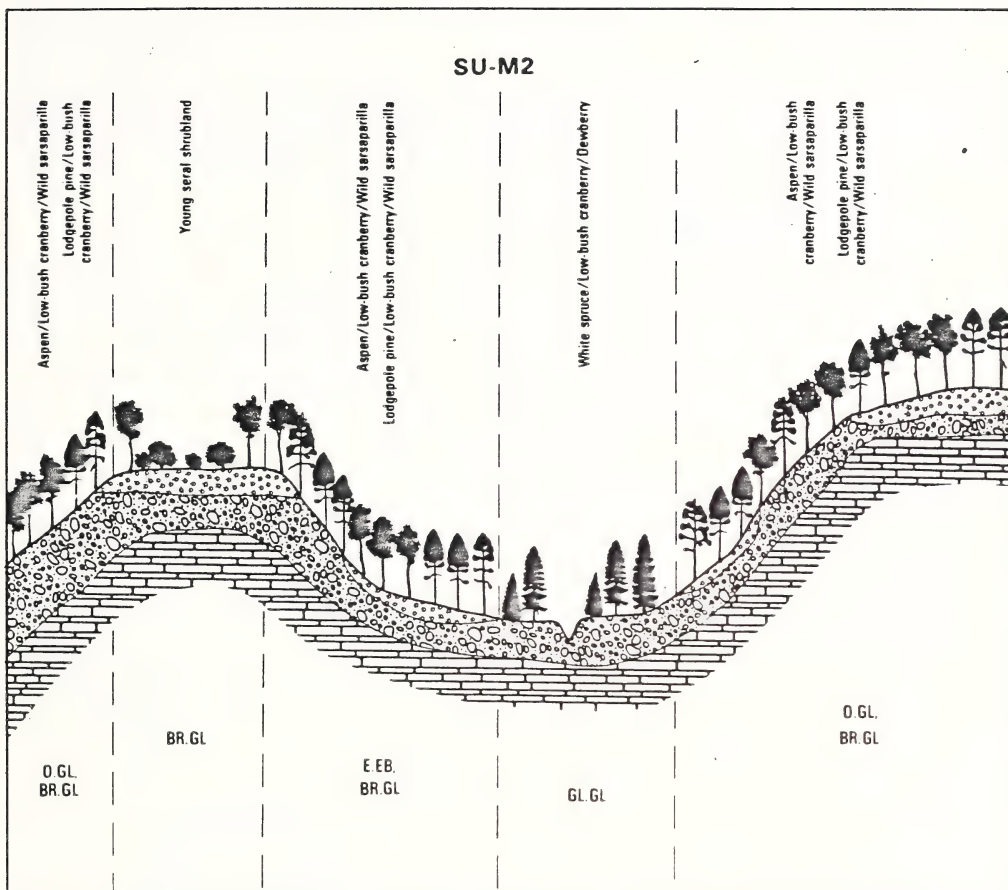


Figure 118: Schematic Diagram of Ecosection SU-M2

Physical Conditions:

This extensively dissected slope (Figure 115) occurs immediately east of the Smoky River and is comprised of thick Continental tills overlying moderate to very strongly sloping bedrock. Residual sandstone materials are common along the upper slopes where till deposits are either thin or have been eroded. Thin colluvial or fluvial veneers commonly overlie till deposits on lower slope positions. Surface expression is inclined to ridged, and lower slopes are extensively gullied.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mvb R	SiCL-kSiL	9-45	2-3	BR.GL, O.GL	White spruce/Low-bush cranberry/ Dewberry Lodgepole pine/Low-bush cranberry/ Wild sarsaparilla Aspen/Low-bush cranberry/Wild sarsaparilla

Ecoregion: Boreal Foothills

Ecological Conditions

White spruce forest predominates on the rolling ridges in the northern part of this ecosection where groundwater discharge is pronounced. Where trees have been harvested, dense shrubland forms the current vegetation. Aspen stands are found on southern exposures.

Lodgepole pine forest predominates on the steeper slopes in the southern part of the ecosection, with white spruce stands occurring in seepage tracks.

Physical Conditions:

This inclined to ridged system (Figure 119) occurs along the gently to very strongly sloping eastern valley walls of the Simonette River and consists dominantly of Continental tills of variable thicknesses with significant portions of colluvium occurring on steeper upper slopes. Colluvial materials are derived from deposits of till and weathered bedrock.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	kSL-S1L	6-30	2-3	O.GL, BR.GL, PZ.GL	Lodgepole pine/Alder/Dewberry Lodgepole pine/Twisted stalk/ Feathermoss Lodgepole pine/Labrador tea/ Feathermoss
$\frac{Cv}{R}$	kSL-kS1L	31-45	1-3	O.R, E.EB, BR.GL	Lodgepole pine/Hairy wild rye Lodgepole pine/Alder/Dewberry

Ecoregion: Boreal Uplands

Ecological Conditions

Lodgepole pine forest covers most of the ecosection, with local variation in vegetation composition caused by aspect. On southern exposures, aspen forms a significant portion of the tree canopy, while northern exposures have stands of white spruce scattered within the pine forest.

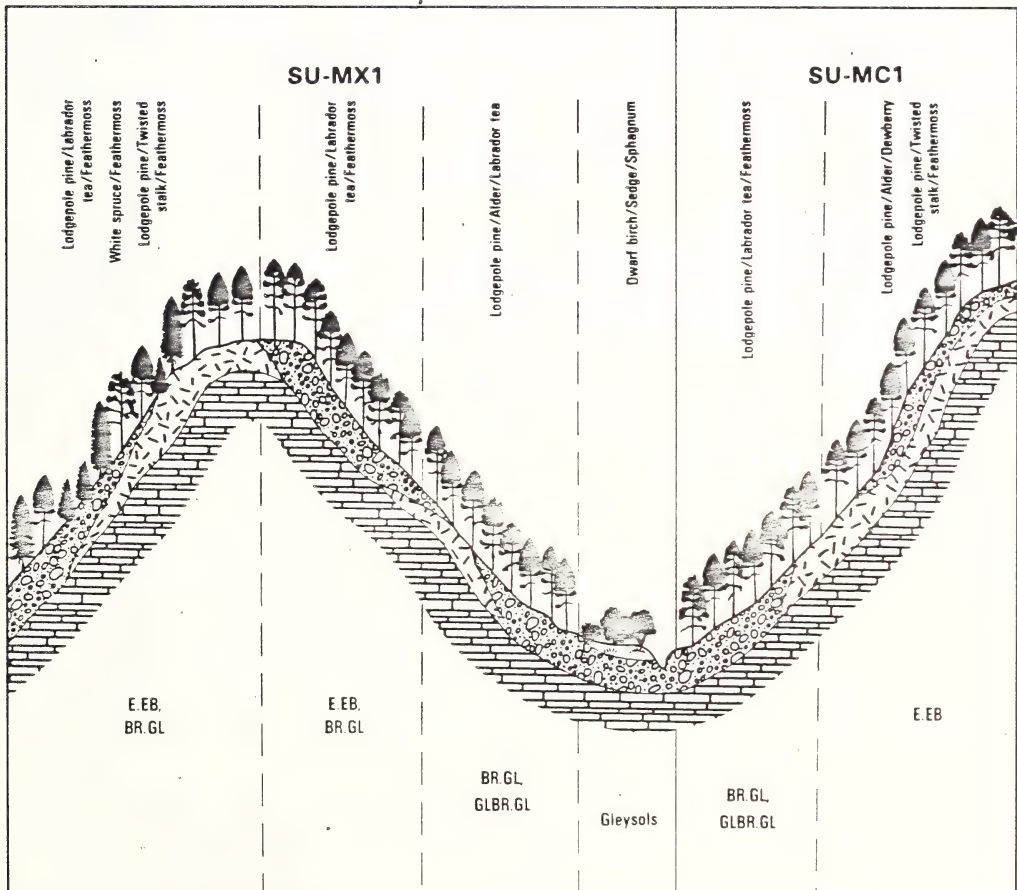


Figure 119: Schematic Diagram of Ecosections SU-MC1 and SU-MX1

Physical Conditions:

This system (Figure 119) includes portions of an upland plateau remnant that has been strongly dissected by numerous tributary streams of the Simonette River. The topography is strongly inclined and ridged, with slopes varying from nearly level to gentle on upland areas to moderate and very strong on side slopes. Surficial materials are comprised of a mixture of Continental tills and residual sandstone materials, the latter occurring on highly eroded ridge tops and steep upper slopes. Thicker till deposits are found on lower slope positions and valley bottoms and are commonly overlain by a combination of coarser-textured fluvial and colluvial veneers. Bedrock is exposed where stream action has caused over-steepening of slopes. Small areas of sphagnum peat develop in valley bottoms where drainage is impeded.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOIL	PLANT ASSOCIATION
M, Mb R	KL-SL	2-30	2-4	BR.GL, O.GL, GLBR.GL	Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/Alder/Labrador tea
Xv, Mv R R	kSiL-SiCL	9-45	2-4	BR.GL, E.EB, GLBR.GL	Lodgepole pine/Labrador tea/ Feathermoss White spruce/Feathermoss Lodgepole pine/Twisted stalk/ Feathermoss
Ov M	Mesic SiCL	0-2	5-6	Peaty Gley- sols, Mesic- sols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

Groundwater movement affects the pattern of vegetation in this ecosection. Lodgepole pine forest predominates on well-drained ridge tops and upper slopes, with a dense alder understory along seepage tracks. White spruce stands are common on lower slopes receiving seepage water, especially on northern exposures. Organic soils that have developed in groundwater discharge areas on valley bottoms support open black spruce forest and dwarf birch shrubland. White spruce groves occur on better-drained valley bottom sites.

Physical Conditions:

This narrow, gently to strongly undulating plateau remnant (Figure 115) acts as a drainage divide between the Smoky and Simonette Rivers. Surficial materials consist of a complex of thin morainal veneers and residual sandstone materials overlying bedrock. Till deposits are moderately stony and are of Continental origin. The thinness of till deposits suggests that this was one of the first areas exposed following glaciation. Several small glacial meltwater channels criss-cross the area, however, no significant glaciofluvial deposits occur. Small deposits of pre-glacial gravels occur locally. Slopes vary from nearly level to strongly sloping.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{M_v}{R}, \frac{X_v}{R}$	S1CL-kS1L	2-30	2-4	BR.GL, O.GL, GL.GL, GLBR.GL	Lodgepole pine/Alder/Labrador tea Lodgepole pine/Labrador tea-Tall bilberry Lodgepole pine/Tall bilberry/Five- leaved bramble

Ecoregion: Subalpine
Boreal Uplands

Ecological Conditions

Closed lodgepole pine forests occur across the entire ecosection. Above 1 280 m, understories are characteristic of the Subalpine ecoregion. Most of the ecosection is characterized by lodgepole pine forest typical of the Boreal Uplands ecoregion. On larger, level plateau remnants, however, there is a significant component of black spruce because shallow bedrock impedes groundwater percolation. White spruce stands are found on gentle northern exposures. Subalpine fir is common in these stands because of groundwater seepage.

Physical Conditions:

This gently inclined to moderately rolling plateau remnant (Figure 114) is covered with Continental till and residuum. Residual sandstone materials predominate in areas where till deposits are either thin or absent. Extensive areas of imperfectly to poorly drained topography develop where thin surficial materials overlie slowly permeable bedrock. Colluvial materials, derived from weathered bedrock and till deposits, occur locally in the western portion of this ecosection.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mvb, Xv R R	SiCL-KSL	2-15	2-3	BR.GL, O.GL	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Tall bilberry/Five- leaved bramble
			4-5	GLBR.GL, Gleysols	Black spruce-Lodgepole pine/Tall bilberry

Ecoregion: Subalpine

Ecological Conditions

This area occurs at the highest elevations in the subregion, and thus has a relatively cool, moist climate. Lodgepole pine forest covers much of the ecosection, but because of climatic differences and poor drainage due to the subdued topography, there are extensive areas of black spruce-lodgepole pine forest as well. High soil moisture levels compared to most of the subregion are also reflected in the high incidence of subalpine fir regeneration in pine stands.

2.3 The Rocky Mountain Foothills Region

The region occurs in the southwestern portion of the study area and extends from the Smoky River in the southeast to the Narraway River in the northwest (Figure 7). Elevations range from 885 m within the Smoky River valley to 2 340 m atop Coal Ridge. Relief is highly variable and generally in the order of 400 m.

The area is distinguished from the other regions within the study area on the basis of structural deformation. Bedrock ranges in age from Jurassic to Cretaceous and includes sandstones, siltstones and shales of the Alberta, Blairmore and Fernie Groups and the Nikannasin Formation with interbedded conglomerate and coal seams. The structure in the region consists of a series of southwest dipping "en echelon" thrust faults which has resulted in a series of northwest striking ridges with steep-sided valleys.

Surficial materials consist of moraine and colluvium which occur equally across the region, with residuum commonly intermixed with till deposits where tills are thin. Cordilleran tills predominate in the south and west while Continental tills are more common on lower slopes in the north and east. Minor amounts of glaciofluvial and glaciolacustrine deposits are found adjacent to the major stream courses.

The Rocky Mountain Foothills lie within parts of the Subalpine, Alpine, Boreal Uplands and Montane ecoregions resulting in a variable vegetation pattern.

Lodgepole pine, white and Engelmann spruce and aspen forests can all be found with alpine meadows and grasslands occurring locally.

The region has been subdivided into four subregions/ecodistricts. Topography, surficial materials and vegetation within each are shown in Table 23.

Table 23

MAJOR CHARACTERISTICS OF THE SUBREGIONS FOUND IN THE
*ROCKY MOUNTAINS FOOTHILLS REGION

SUBREGION	TOPOGRAPHY	SURFICIAL MATERIALS	VEGETATION
Copton Foothills	Narrow northwest trending plateau remnants and dissected side slopes	Moraine, residuum, colluvium	Lodgepole pine, White spruce, Engelmann spruce, Subalpine fir, black spruce
Foothill Ridges	Northwest trending cuesta-like ridges and plateau remnants	Moraine, residuum, colluvium	Lodgepole pine, Engelmann X white spruce, shrublands
Smoky Valley	Northeast-trending ridges and uplands	Colluvium, residuum, moraine, glaciofluvial	Aspen, grasslands, Lodgepole pine, white spruce

*Note: Bedrock across the region consists of varied formations of Jurassic to Cretaceous age which have been structurally deformed into a series of northwest striking ridges.

2.3.1 Copton-Foothills Subregion (Ecodistrict)

Paralleling the Kakwa Foothills subregion, the Copton Foothills extend from Sheep Creek in the southeast to Torrens Ridge in the northwest (Figure 120). Structurally, the subregion is made up by what is referred to as the Copton anticline (Irish, 1949). Geologically, this consists of a narrow, simple and nearly symmetrical fold trending northwesterly, roughly separating the contoured strata in the southwest from the gently dipping beds to the northeast. The bedrock within the subregion is made up of Lower to Upper Cretaceous strata. The ridge-like topography of the subregion gives a varied relief of approximately 850 m. A large portion of the Copton Foothills occurs within the Subalpine ecoregion with parts of the Boreal Uplands ecoregion occurring within the river valleys.

The dominant surficial material in this subregion is thin Cordilleran till intermixed with residual materials. Significant amounts of colluvium are found on most steep side slopes. In addition, minor amounts of glaciofluvial and glaciolacustrine materials are found along the major river valleys.

Lodgepole pine forests occur throughout the subregion on all surficial materials. White spruce, Engelmann spruce and subalpine fir are common on most northern exposures. More poorly drained areas support black spruce/lodgepole pine with some dwarf birch shrublands.

The Copton Foothills subregion is divided into fourteen system/ecosections (Table 24) which reflects the complex nature of the

Table 24

SUMMARY OF ECOSECTIONS IN THE COPTON FOOTHILLS SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
CF-C1	Extreme slopes and scarp faces	Thin colluvium with bed-rock outcrops	Lodgepole pine and Engelmann spruce-Subalpine fir forest, subalpine grassland and shrubland
CF-C2	Steeply sloping ridges	Thin, moderately coarse-textured colluvium	Lodgepole pine and Engelmann spruce-subalpine forest, subalpine grassland
CF-CM1	Ridged upper slopes and rolling lower slopes	Moderately coarse-textured till and colluvium	Lodgepole pine and Engelmann spruce-subalpine fir forest
CF-GF1	Nearly level outwash terraces	Glaciofluvial sand and silt and peat	Lodgepole pine and aspen forest, dwarf birch shrublands
CF-GF2	Nearly level terraces with kames and eskers	Glaciofluvial sand and silt over till	Lodgepole pine and black spruce-pine forest, treed and shrubby muskeg
CF-GF01	Glacial meltwater channel	Thin glaciofluvial sand over till, and peat	Lodgepole pine and black spruce-pine forest, dwarf birch shrubland
CF-GL1	Gently sloping basin	Glaciolacustrine silt over glaciofluvial sand	Lodgepole pine forest and dwarf birch shrubland
CF-GL2	Nearly level terraces	Glaciolacustrine silt and clay over glaciofluvial sand	Lodgepole pine, black spruce and black spruce-lodgepole pine forest
CF-M1	Rolling lower slopes	Thin, medium-textured till with sandy overlays	Lodgepole pine, Engelmann spruce-subalpine fir and black spruce-lodgepole pine forest, dwarf birch shrublands
CF-M2	Ridged plateau	Thin, medium-textured till and residual materials	Lodgepole pine forest and dwarf birch shrublands
CF-M3	Dissected benchland	Thin, medium-textured till, colluvium and residual materials, and peat	Lodgepole pine and black spruce-lodgepole pine forest, and dwarf birch shrublands
CF-MC1	Ridged upland and rolling slopes	Moderately coarse to moderately fine-textured till and colluvium	Lodgepole pine and Engelmann spruce-subalpine fir forest
CF-X1	Ridged upland	Medium-textured residual materials	Lodgepole pine and Engelmann spruce-subalpine fir forest

landscape. A generalized description of each ecosection/system with accompanying schematic diagrams follows.

Within the subregion five distinctive fluvial systems have been identified (F8, F12, F13, F15, F17). These systems are described in detail in Section 2.5, Volume I of this report.

Physical Conditions:

This system (Figure 121) occurs throughout the Copton Foothills subregion and includes the scarp faces of both Hat Mountain and Copton Ridge along with the steep side slopes of the upland plateaus (CF-M2) located southeast of the Kakwa River. Surficial materials include active and inactive colluvial materials overlying bedrock. They are derived from moderately coarse to moderately fine-textured residuum and Cordilleran tills. Numerous bedrock outcrops occur, especially along the upper scarp face of Hat Mountain and Copton Ridge. Minor areas of moraine are present on gentler slopes, but are often in association with colluvium. Surface expression is inclined and ridged.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	SL-SCL	31-70	1-2	O.R, Brunisols	Lodgepole pine/Hairy wild rye Engelmann x White spruce/ Feathermoss Subalpine grassland
		16-45	2-3	Brunisols, BR.GL	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Labrador tea/Tall bilberry Engelmann x white spruce/ Feathermoss
$\frac{Cvb}{M}$		10-31	3-4	BR.GL, GLBR.GL	Engelmann x white spruce/ Feathermoss Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

Lodgepole pine forest occurs throughout the ecosection, but aspect has a significant influence on local vegetation composition on these steep slopes. On southern aspects, the tree canopy is relatively open, and forest and grassland communities are intermixed. On cooler northern exposures the pine canopy is closed, and Engelmann spruce-subalpine fir forest is found in association with lodgepole pine.

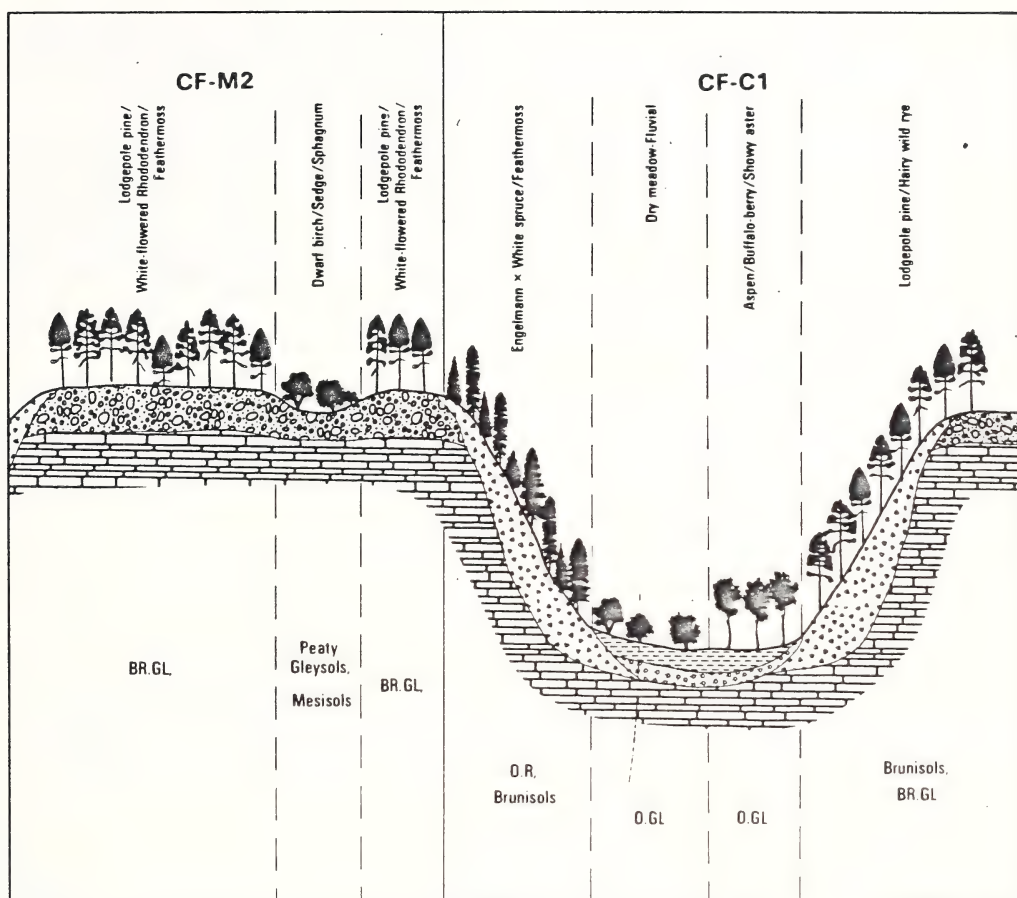


Figure 121: Schematic Diagram of Ecosystems CF-C1 and CF-M2

Physical Conditions

This system is a series of steep ridges, northwest-trending, found between Laforce Creek and Cutpick till (Figure 122). Surficial materials consist of thin deposits of active and inactive colluvium derived from locally weathered bedrock. The bedrock is relatively resistant and not prone to slumping, although there is a moderate amount of gullying on upper slopes.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	SL-SCL	16-70	1-3	O.R. Brunisols	Lodgepole pine/Hairy wild rye Subalpine grassland, Engelmann spruce-Subalpine fir/Feathermoss Lodgepole pine/White-flowered rhododendron

Ecological Conditions

Slope and aspect are the major influences on vegetation composition. Subalpine grasslands are found on the steepest south-facing slopes. Relatively open lodgepole pine forest with a grassy understory is found on gentler slopes exposed to the southwest, while northeast exposures support lodgepole pine and Engelmann spruce-Subalpine fir forest.

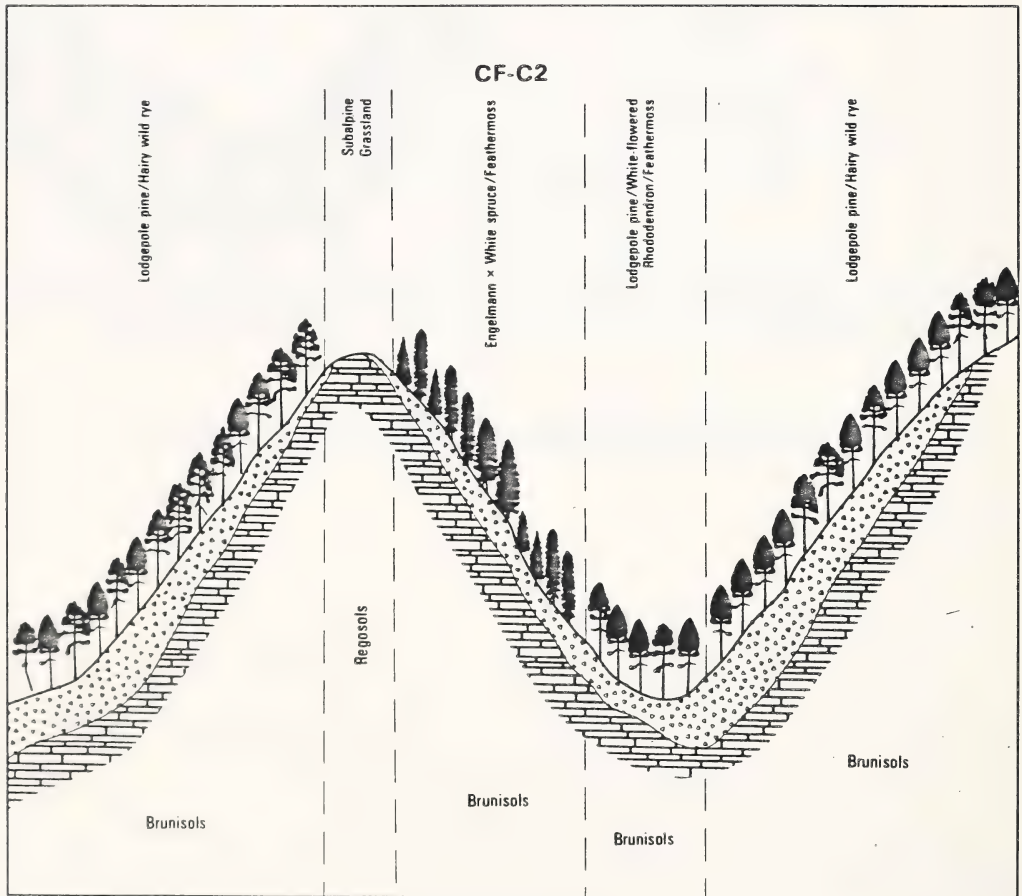


Figure 122: Schematic Diagram of Ecosection CF-C2

Physical Conditions

Occurring immediately adjacent to Hat Mountain and Copton Ridge, this system consists of a complex of moraine, residuum and colluvial deposits that have been extensively dissected by numerous tributary streams of the Kakwa River (Figure 123). Across the ecosection surface expression ranges from inclined, ridged and steep on upper slopes where colluvium and residuum predominate to undulating, subdued and rolling within the valley bottoms where morainal deposits are much thicker. Slopes range from gentle to extreme. The high incidence of gullying and slumping on steep slopes is related to the occurrence of shales of the Shaftsbury Formation in the underlying bedrock.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	SL-SiCL	3-30	2-3	BR.GL, E.EB	Lodgepole pine/Tall bilberry/Five-leaved bramble Lodgepole pine/White-flowered rhododendron
$\frac{Xv/Cv}{R}$	SL	16-50	2-3	Brunisols	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Hairy wild rye Aspen/Buffaloberry/Showy aster Engelmann x White spruce/ Feathermoss

Ecoregions: Subalpine
Boreal Uplands

Ecological Conditions

Lodgepole pine forest predominates across this ecosection, with local variation in vegetation composition caused by differences in aspect and elevation. Aspen forest occurs with lodgepole pine on steep southern exposures at low elevations, while Engelmann spruce-Subalpine fir forest is associated with lodgepole pine on northern exposures.

Physical Conditions:

Located adjacent to the confluence of Lynx Creek and the Kakwa River, this system consists of a series of level to nearly level outwash terraces that have been dissected by glacial meltwater channels (Figure 123). These terraces occur approximately 30-60 m above the present floodplain of the Kakwa River. Surficial materials include coarse to medium-textured glaciofluvial deposits of variable thickness. Organic accumulations of sphagnum peats occur in former meltwater channels.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GF	S-SL	0-5	1-2	Brunisols	Lodgepole pine/Labrador tea/ Feathermoss Aspen/Buffaloberry/Showy Aster
Ov GF	Mesic S-SL	0-2	5-6	Gleysols, Mesisols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

The vegetation pattern is controlled by differences in drainage conditions, with lodgepole pine forest predominant on well drained sand deposits, and dwarf birch shrublands on peat deposits in meltwater channels. Aspen forest is found at low elevations on the narrowest portions of these terraces.

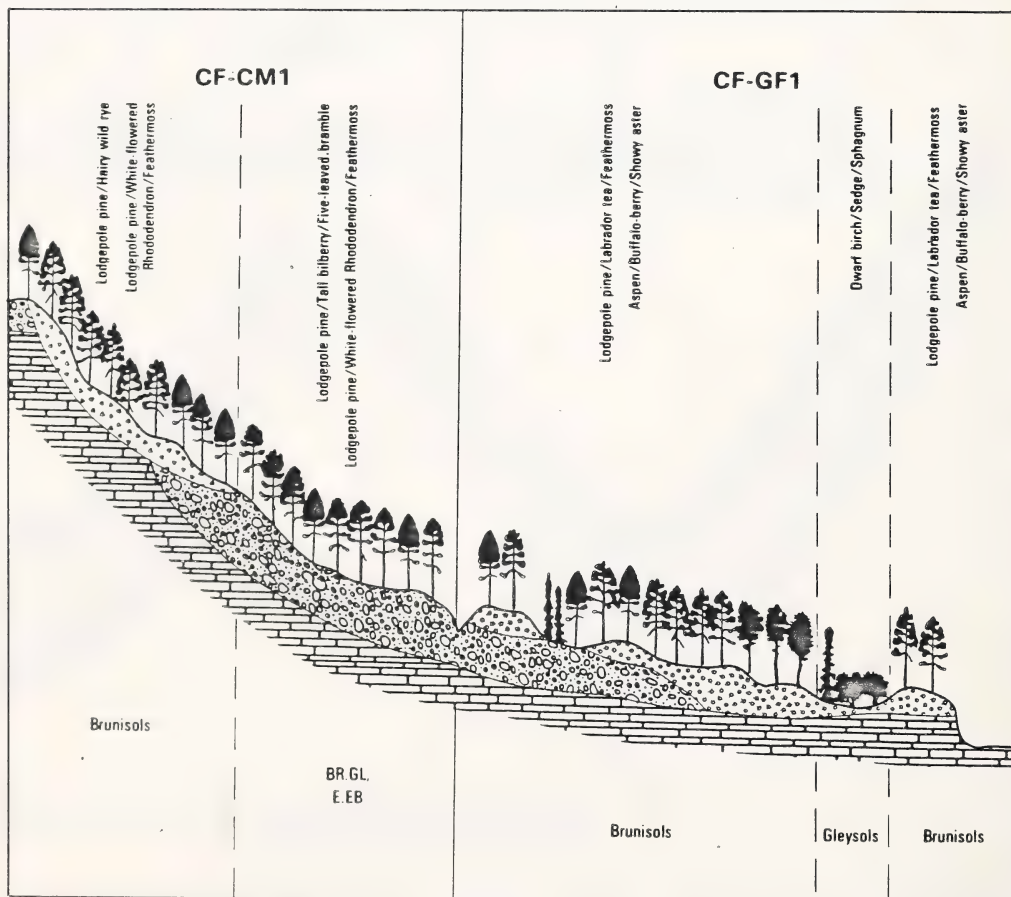


Figure 123: Schematic Diagram of Ecosections CF-CM1 and CF-GF1

Physical Conditions:

This system includes the level to nearly level glaciofluvial terraces that border the Narraway River and Stetson Creek (Figure 124). Located between 30-250 m above the present valley floors, this ecosection consists of a complex of kames, eskers and glacial meltwater channels. Accumulations of sphagnum peat are confined to meltwater channels where the underlying bedrock is close to the surface.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GF	S-SL	0-5	2-3	BR.GL, Brunisols	Lodgepole pine/Labrador tea/Feathermoss
$\frac{GF}{R}$	S-SL	0-5	4	GLBR.GL	Black spruce-Lodgepole pine/Tall bilberry
$\frac{Dvb}{GF}$	$\frac{Mesic}{SL}$	0-2	5-6	Gleysols, Mesisols	Black spruce/Common horsetail/Feathermoss Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

Coniferous forest predominates across this ecosection, grading from lodgepole pine to a mixture of black spruce-lodgepole pine as availability of soil moisture increases. Open black spruce forest and dwarf birch shrublands are found in depressional areas, which are not common. A few aspen stands are found on bedrock outcrops on the north side of the Narraway River.

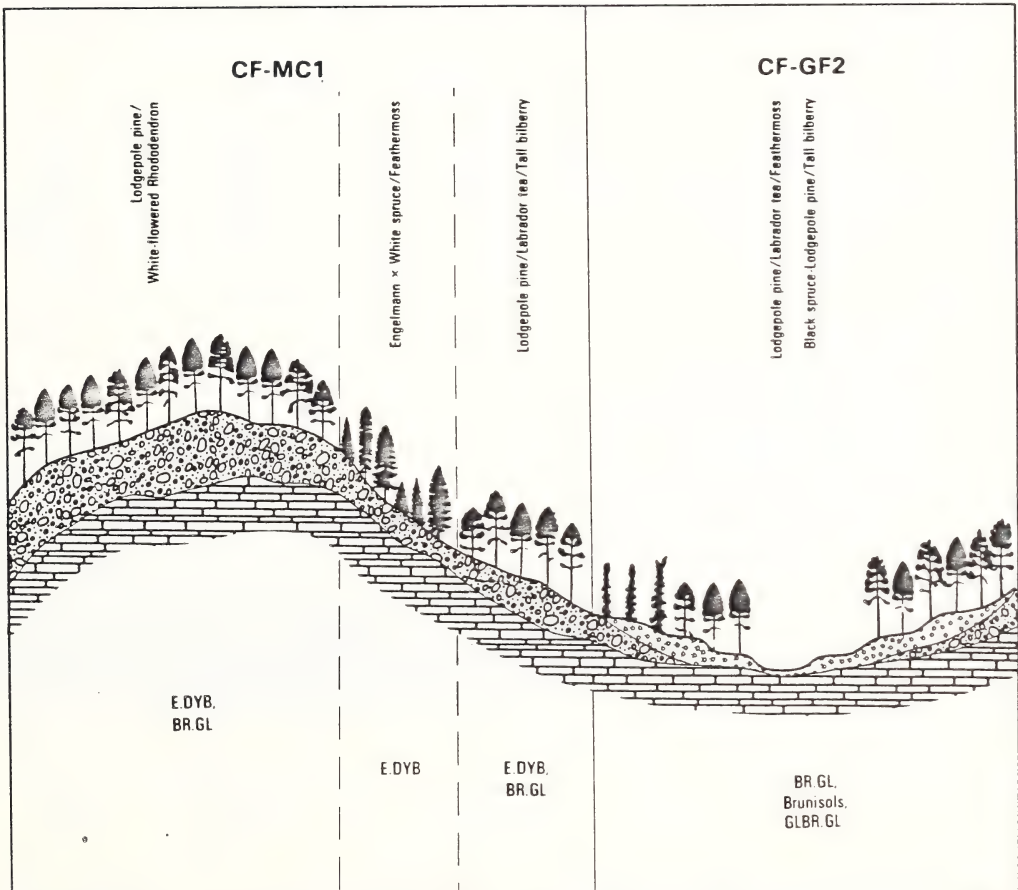


Figure 124: Schematic Diagram of Ecosections CF-GF2 and CF-MC1

Physical Conditions:

Located between Flume Creek and the Narraway River, this glacial meltwater channel consists of moderately well to imperfectly drained pitted deltaic deposits and poorly to very poorly drained accumulations of sedge and sphagnum peats (Figure 125). Sandy glaciofluvial deposits occur around the periphery of the system and are underlain by moderately fine textured Cordilleran tills.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GF v M	S STCL	2-5	3-4	BR.GL, GLBR.GL	Black spruce-Lodgepole pine/ Labrador tea/Tall bilberry
GF	S	2-5	3	E.EB, BR.GL	Lodgepole pine/Labrador tea/ Feathermoss
Ovb M	Mesic STCL	0-2	5-6	Peaty Gley- sols, Mesic- sols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions:

Surficial materials are coarse-textured, but input of groundwater from adjacent slopes and the slow permeability of underlying till causes imperfectly drained conditions to predominate, and most of the ecosection is covered with black spruce-lodgepole pine forest. Pine forest is found on better drained sandy ridges, and small amounts of dwarf birch shrubland occur on depressional terrain.

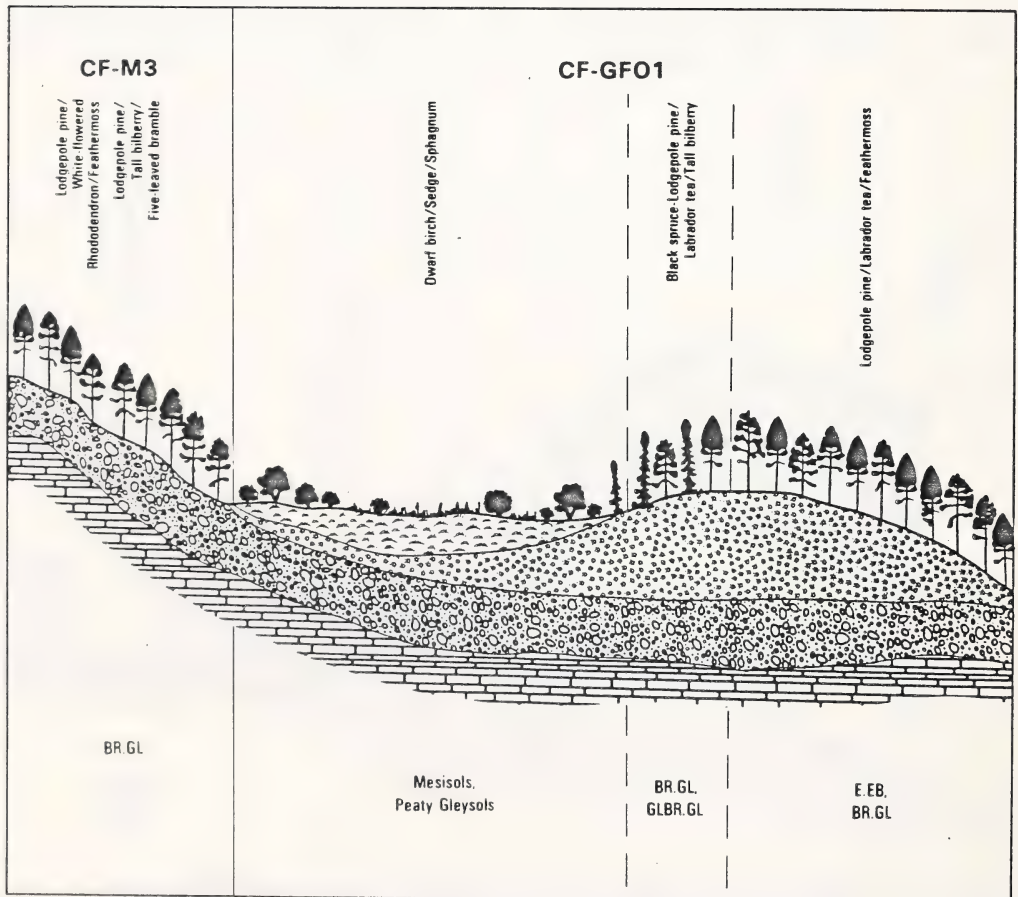


Figure 125: Schematic Diagram of Ecosections CF-GF01 and CF-M3

CF-GL1

Physical Conditions:

Located along the lower portion of Adelaide Creek, this system consists of thin, gently sloping glaciolacustrine deposits overlying coarse-textured glaciofluvial sands (Figure 126). Slope wash materials are common adjacent to CF-C1. The glaciolacustrine sediments are the likely result of a short lived ice dam within the Copton Creek valley. The surface expression of these deposits is generally level to undulating.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GLVb GF	SiCL S	6-9	2-3	O.GL	Lodgepole pine/Labrador tea/ Feathermoss
			3-4	CU.R, GLCU.R	Dry meadows-fluvial, Dwarf birch/ Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions:

A mixture of grassland and shrubland covers most of this ecosection, because of the prevalence of groundwater seepage. Lodgepole pine forest is found on better-drained upper slopes.

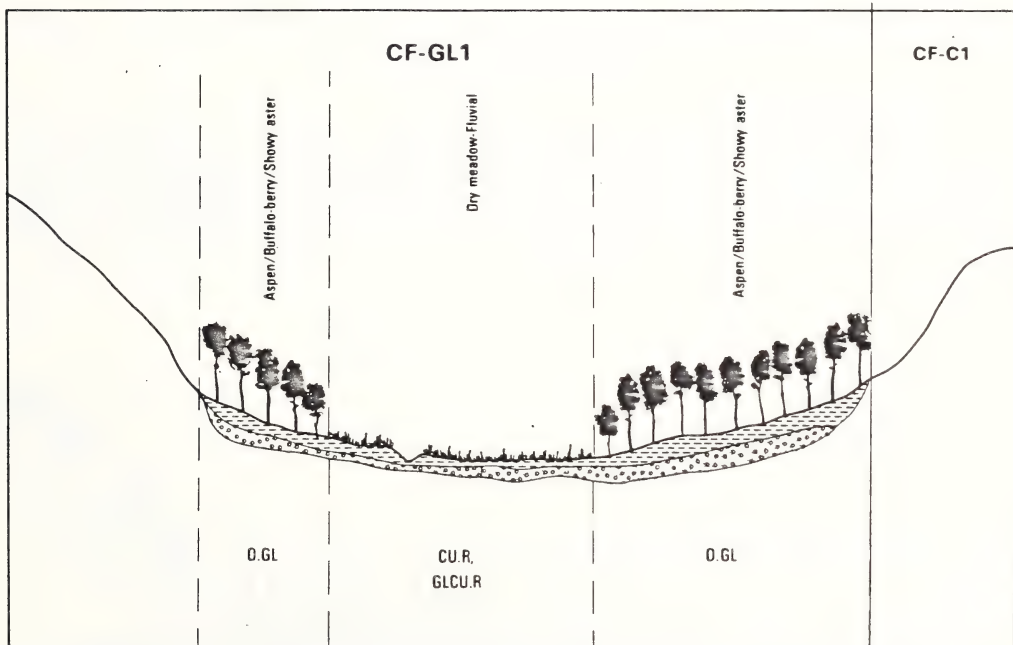


Figure 126: Schematic Diagram of Ecosection CF-GL1

Physical Conditions:

This level to nearly level glaciolacustrine terrace (Figure 127) borders Stetson Creek and includes the area between Two Lakes. These poorly drained glaciolacustrine sediments are a possible result of ice damming on either Stetson Creek or the Narraway River. Adjacent to the confluence of these two stream courses, moderately fine textured glaciolacustrine deposits are underlain by coarse textured glaciofluvial materials, leading to better soil drainage. Alluvial fans occur between the two lakes in this system, and groundwater discharge from adjacent slopes is pronounced.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Ov}{GL}$	$\frac{Mesic}{CL}$	0-2	5-6	Peaty Gleysols, Mesisols	Black spruce/Common horsetail/Feathermoss
$\frac{GLvb}{GF}$	$\frac{SiCL-CL}{S}$	0-2	2-3	O.GL, BR.GL, GL.BRGL	Lodgepole pine/Labrador tea/Feathermoss Black spruce-Lodgepole pine/Tall bilberry
$\frac{Fv}{GL}$	$\frac{rSL}{CL}$	6-15	3-4	Brunisols, Gleyed Brunisols, CU.R	White spruce/Feathermoss

Ecoregion: Boreal Uplands

Ecological Conditions

Open and closed black spruce forest covers most of the ecosection because of the prevalence of poorly drained conditions. Lodgepole pine forest occurs in better drained areas, while white spruce forest is found on alluvial fans.

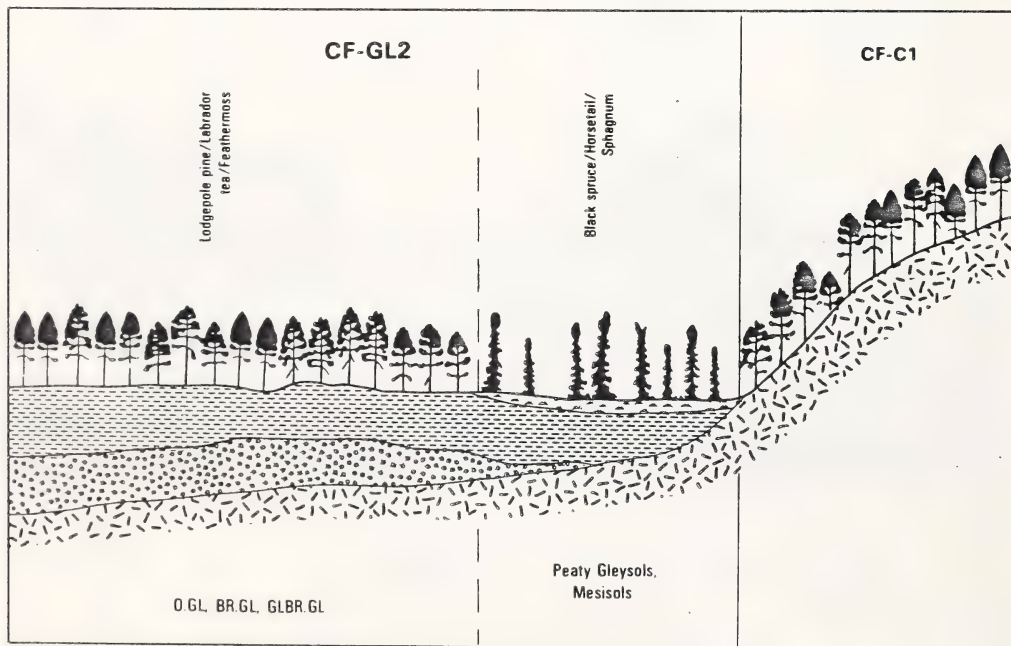


Figure 127: Schematic Diagram of Ecosection CF-GL2

Physical Conditions:

This system includes the lower slopes of the valleys of Lynx Creek and the headwaters of Stetson and Hat Creeks (Figure 128). Surface expression is undulating to rolling, and till deposits cover most of the landscape. Fluted till is found around the confluence of Lynx Creek and the Kakwa River. Minor meltwater channels and eskers are found in the area, and thin glaciofluvial deposits overlay moraine on lower valley position. Organic deposits occur in meltwater channels and depressional terrain.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATIONS
$\frac{Mvb}{R}$	SiCL-CL	2-30	2-3	BR.GL, E.DYB	Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ White-flowered rhododendron Lodgepole pine/Labrador tea/Tall bilberry
			4-5	GLBR.GL, Gleysols	Black spruce-Lodgepole pine/ Labrador tea/Tall bilberry
$\frac{GFv}{M}$	$\frac{Si-S}{SiCL}$	2-5	1-2	E.DYB, BR.GL	Lodgepole pine/Labrador tea/ Feathermoss
$\frac{Ovb}{M}$	$\frac{Mesic}{SiCL}$	0-2	5-6	Peaty Gley-sols, Mesic-sols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine
Boreal Uplands

Ecological Conditions

Variation in the availability of soil moisture is the dominant influence in the vegetation pattern, with variation in aspect having a secondary effect. Lodgepole pine forest predominates on subdued ridges, in association with stands of Engelmann spruce and subalpine fir on northern exposures. The vegetation on depressional terrain varies from black spruce-lodgepole pine forest where drainage is imperfect to dwarf birch shrubland on poorly drained organic soils.

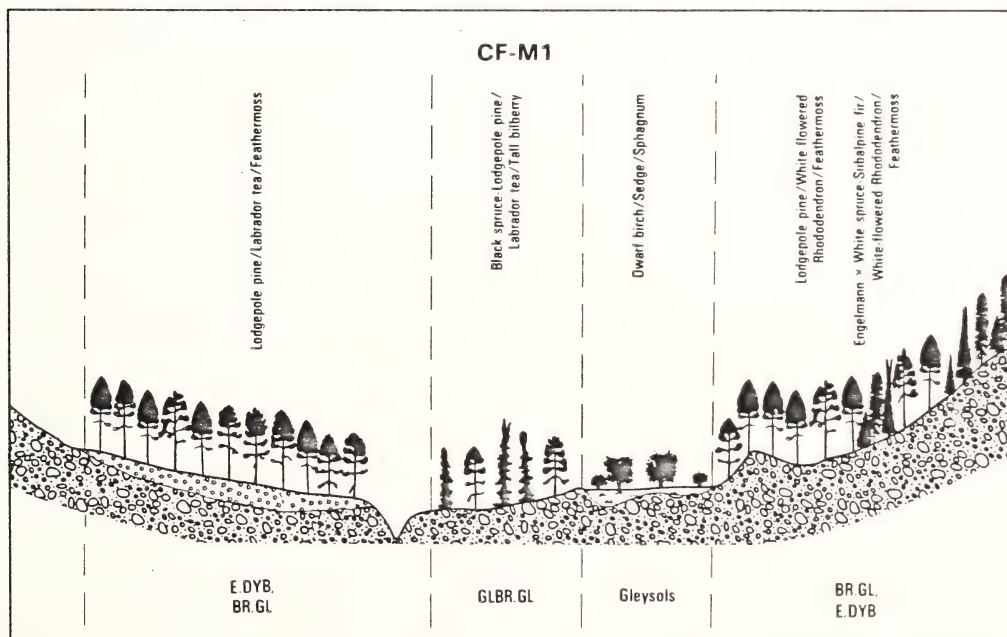


Figure 128: Schematic Diagram of Ecosection CF-M1

Physical Conditions:

Consisting of the remnant portions of a former plateau, this system is found south and east of the Kakwa River (Figure 121). It has been deeply dissected by tributaries of both the Kakwa River and Copton Creek and surface expression is ridged to subdued with gentle slopes.

Surficial deposits include medium to moderately fine textured Cordilleran tills overlying resistant bedrock of the Luscar formation. Where tills have been eroded away by fluvial action, residual materials are commonly exposed. Small organic accumulations occur in depressional terrain but account for less than 10% of the total area.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mv R	SL-SiCL	6-30	2-4	BR.GL	Lodgepole pine/White-flowered rhododendron
Ov M	Mesic STCL	0-2	5-6	Peaty Gley- sols, Mesic- sols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

Lodgepole pine forest covers relatively well-drained bedrock-controlled ridges, while dwarf birch shrubland is found in the poorly drained depression between ridges.

Physical Conditions:

This system includes the benchland-like topography located north and west of the Narraway River that has been deeply dissected by Goat Creek and its tributaries (Figure 125). Moraine of Cordilleran origin overlies bedrock with colluvium found on steeper slopes, and residuum is often complexed with moraine in areas where bedrock is near the surface. Accumulations of sphagnum peats occur in very poorly to poorly drained depressions and account for less than 15% of the area. Surface expressions vary from rolling and ridged atop the plateau to inclined and undulating in valleys.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	SL-S1CL	2-15	2-4	BR.GL, GLBR.GL	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Tall bilberry/Five- leaved bramble Black spruce-Lodgepole pine/Tall bilberry
$\frac{Cv}{R}$	SL	16-45	2-3	E.DYB	Lodgepole pine/Hairy wild rye/ Engelmann x white spruce/Feather- moss
$\frac{Ovb}{M}$	$\frac{Mesic}{S1CL}$	0-2	5-6	Peaty Gley- sols, Mesic- sols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

The vegetation pattern in this ecosection is determined by a topographically controlled soil moisture gradient. Lodgepole pine forest predominates on well-drained upper slopes, with spruce-fir stands confined to seepage tracks. Black spruce-lodgepole pine forest is found in groundwater discharge areas on lower slopes, in association with lodgepole pine forest on better drained sites. Dwarf birch shrublands cover poorly drained valley bottoms, and also occur in groundwater catchment areas on slopes.

Physical Conditions:

This system occurs southeast of the Narraway River and is centered around the confluence of Stetson Creek and the Torrens River (Figure 124). Surface expression is ridged and inclined on upland areas and undulating to rolling on lower slopes. Ground moraine of Cordilleran origin is the principal surficial material across most of the ecosection. Colluvial materials are often intermixed with till deposits.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	SL-SfCL	2-30	2-4	E.DYB, BR.GL	Lodgepole pine/Labrador tea/Tall bilberry Lodgepole pine/White-flowered rhododendron/Feathermoss Engelmann x White spruce/Feathermoss
$\frac{Cv}{R}$	SL	16-45	1-3	E.DYB	Engelmann x White spruce/Feathermoss Lodgepole pine/White-flowered rhododendron

Ecoregion: Subalpine
Boreal Uplands

Ecological Conditions

Environmental conditions are relatively uniform across this upland, most of which is covered by lodgepole pine forest. Engelmann spruce-subalpine fir stands occur on side slopes regardless of exposure, reflecting the sporadic occurrence of groundwater seepage. Small patches of dwarf birch shrubland are found in poorly drained valley bottoms.

Physical Conditions:

Located north and west of the Narraway River, this ecosection represents an outcrop of the Brazeau Formation (Figure 129). Surface expression is ridged and inclined with slopes ranging from nearly level to strong. Surficial materials include medium to moderately fine textured residuum which is overlain by a thin, discontinuous veneer of Cordilleran till.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Xvb}{R}$	SL	6-9	2-3	E.DYB, O.R	Lodgepole pine/White-flowered rhododendron/Feathermoss
$\frac{Mv}{X}$	SL-SICL	6-30	2-3	BR.GL	Engelmann x White spruce/ Feathermoss

Ecoregion: Subalpine

Ecological Conditions

The vegetation pattern is typical of the Subalpine ecoregion, with lodgepole pine forests on well drained ridges and Engelmann spruce-Subalpine fir stands confined to cooler, northern exposures.

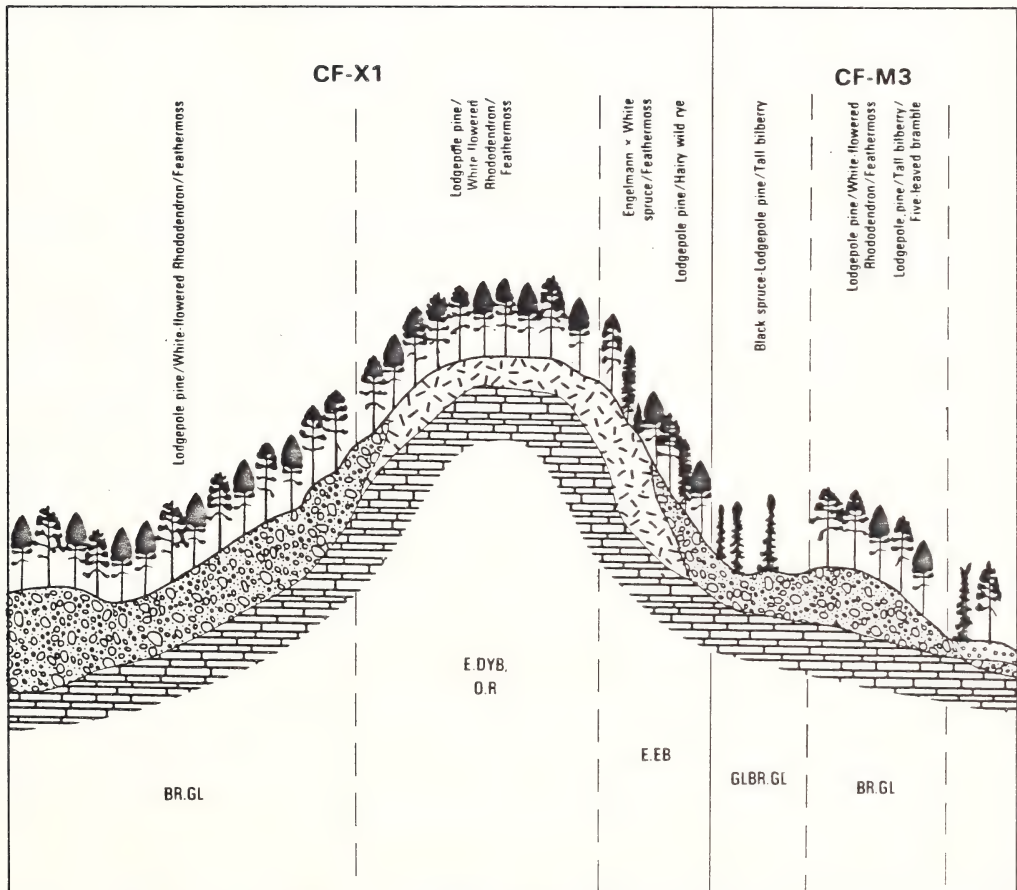


Figure 129: Schematic Diagram of Ecosections CF-X1 and CF-M3

2.3.2 Foothill Ridges Subregion (Ecodistrict)

This subregion is part of the outer foothills and consists of a belt of cuesta-like ridges which mark the outer limit of uplifting by tectonic processes which formed the Rocky Mountains (Figure 130). The presence of large plateau remnants and general lack of seepage distinguishes the Foothill Ridges from other subregions. Most of the area is underlain by Upper Cretaceous bedrock of the Brazeau formation, but strata of the Scollard Member which is part of the Paskapoo Formation occurs at lower elevations. The topography is relatively subdued compared to other subregions. Elevation ranges from 1 070 m along the Kakwa River to 1 850 m on Copton Ridge.

Deposits of Cordilleran and Continental till are found across most of the subregion. These deposits are characteristically thin on ridge tops, where they are associated with weathered residual materials. On lower slopes, till is often covered with veneers of slope wash.

The Foothills Ridges occur mostly within the Subalpine ecoregion, however, the Boreal Uplands ecoregion extends into the area along lower slope positions and valley bottoms. Lodgepole pine dominates across this landscape with Engelmann x White spruce common on northern slopes and at higher elevations. Understory composition reflects the influence of aspect, with ericaceous shrubs dominating on all but southerly aspects where forb and grass layers are more prominent.

The Foothills Ridges subregion is divided into thirteen ecosections/systems (Table 25). A more detailed description of each

system, with accompanying schematic diagrams, follows the table.

The subregion was identified as having five fluvial systems (F8, F12, F13, F15, F17) which are described in Section 2.5 of Volume I.

Physical Conditions:

This system includes the steeply inclined southwest-facing scarp slope of Nose Mountain (Figure 131). Colluvial materials of variable thicknesses derived from tills and weathered sandstones overlie bedrock on lower portions of the slope while residuum is common on upper scarp slopes.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	SL-SiCL	31-70	1-2	O.R, Brunisols	Lodgepole pine/Hairy wild rye
$\frac{Cv}{R}$	SL	70-90	1	O.R	White spruce/Feathermoss Aspen/Buffaloberry/Aster

Ecoregion: Boreal Uplands

Ecological Conditions

A downslope increase in the thickness of the soil produces the vegetation pattern, with aspen groves on steep upper slopes and lodgepole pine forest on middle and lower slopes. White spruce stands are common on seepage tracks on middle and lower slopes as well.

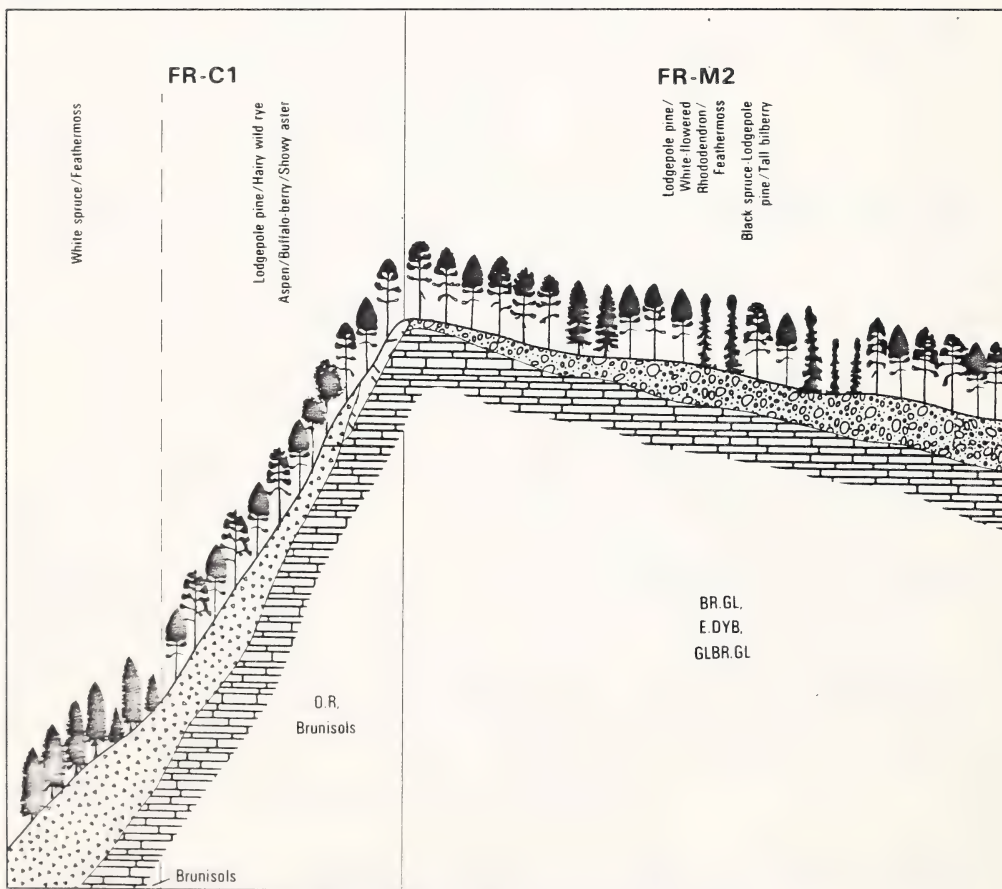


Figure 131: Schematic Diagram of Ecoresections FR-C1 and FR-M2

Physical Conditions:

This system includes the moderately to steeply sloping razor back-like side slopes and valley walls of the plateau (FR-MX2) dissected by tributary streams of Nose and Ravine Creeks (Figure 132). Surface expression ranges from inclined to ridged. Surficial materials include a mixture of inactive and active colluvium derived from Cordilleran tills and residual sandstone materials. The occurrence of the Scollard Member of the Paskapoo formation in the underlying bedrock is the cause of extensive slumping. Ground moraine which occurs on less steeply sloping terrain accounts for approximately 25% of all surficial materials. Residual materials are commonly exposed where tills have been eroded away.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	L-SL	31-80	1-3	O.R., O.DYB, O.EB	Lodgepole pine/Hairy wild rye Lodgepole pine/Labrador tea/Tall bilberry White spruce/Feathermoss
$\frac{Cv}{Mvb}$	L	16-45	2-3	Brunisols, BR.GL	Lodgepole pine/Labrador tea/ Tall bilberry Lodgepole pine/White-flowered rhododendron/Feathermoss White spruce/Feathermoss
$\frac{Mvb}{R}$	L-SiCL	9-30	3	BR.GL	Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/Tall bilberry/Five- leaved bramble

Ecoregions: Boreal Uplands
Subalpine

Ecological Conditions

The vegetation pattern in this ecosection is a reflection of variation in the availability of soil moisture. Lodgepole pine forest is found on plateau remnants where soils are thin and on steep-side slopes and ridgetops; small patches of grassland occur on the driest, steepest southern exposures. White spruce, and at higher elevations, Engelmann spruce-Subalpine fir, forest is wide-spread on gentle slopes and in shallow valleys of intermittent streams.

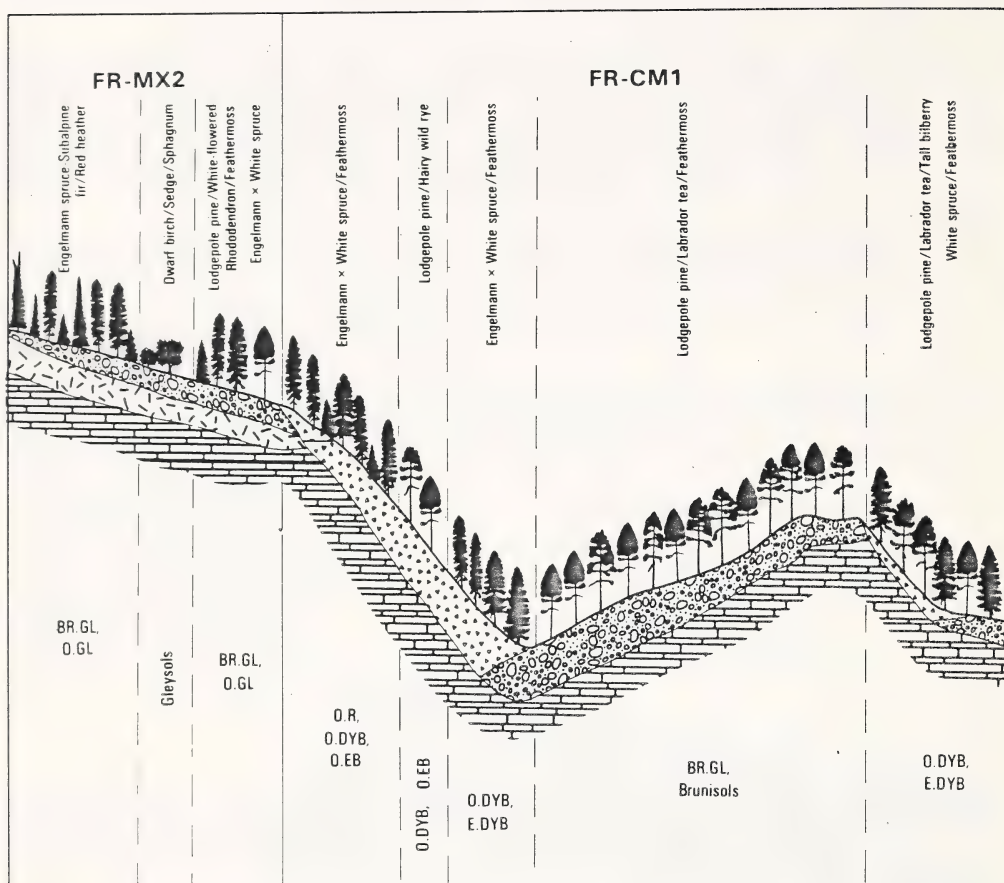


Figure 132: Schematic Diagram of Ecosystems FR-CM1 and FR-MX2

Physical Conditions:

Located between Copton Ridge and Morley Hill, this strongly dissected, gently to extremely sloping system is characterized by extensive slumping and gullying activity (Figure 133). This ecosection also occurs around the upland areas of adjacent to Prairie Creek. Surface expression is dominantly inclined to rolling. Active and inactive colluvium is the principal surficial material across much of the landscape. In addition to colluvium, moraine and residual materials are often complexed, especially in the vicinity of Morley Hill where deposits of Continental till begin to appear.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	SL	16-70	2	Brunisols, O.R	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Hairy wild rye Lodgepole pine/Tall bilberry/Five- leaved bramble Engelmann spruce x White spruce/ Feathermoss
$\frac{Mvb}{R}$	SiL	6-15	2-4	BR.GL, GLBR.GL	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Engelmann spruce x White spruce/Feathermoss

Ecoregion: Subalpine

Ecological Conditions

Groundwater seepage and aspect combine to produce the vegetation pattern in this ecosection. Lodgepole pine forest is found on the relatively dry southern exposures of ridges, with an open canopy and grassy understory on the steepest slopes. Cooler northern exposures support Engelmann spruce-Subalpine fir forest, and deciduous shrubland is found on the bottom of gullies and tributary valleys.

Physical Conditions:

This is a very gently to moderately undulating upland plateau separating Chicken Creek watersheds (Figure 133). This ecosection also includes the upland plateau area surrounding Morley Hill. Deposits consist of thin, medium to moderately fine-textured Continental tills with residual sandstone materials being exposed where tills have been washed off. Flutings and minor meltwater channels are present.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mvb R	L-S1CL	2-15	2-3	O.GL, BR.GL, E.DYB	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Tall bilberry/Five- leaved bramble
			4	GL.GL	Black spruce-Lodgepole pine/Tall bilberry
			5-6	Gleysols, Mesisols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

A large portion of this subdued topography is imperfectly drained and supports black spruce-lodgepole pine forest. Lodgepole pine forest occurs on better drained ridgetops, while dwarf birch shrublands are found in poorly drained depressions and valley bottoms.

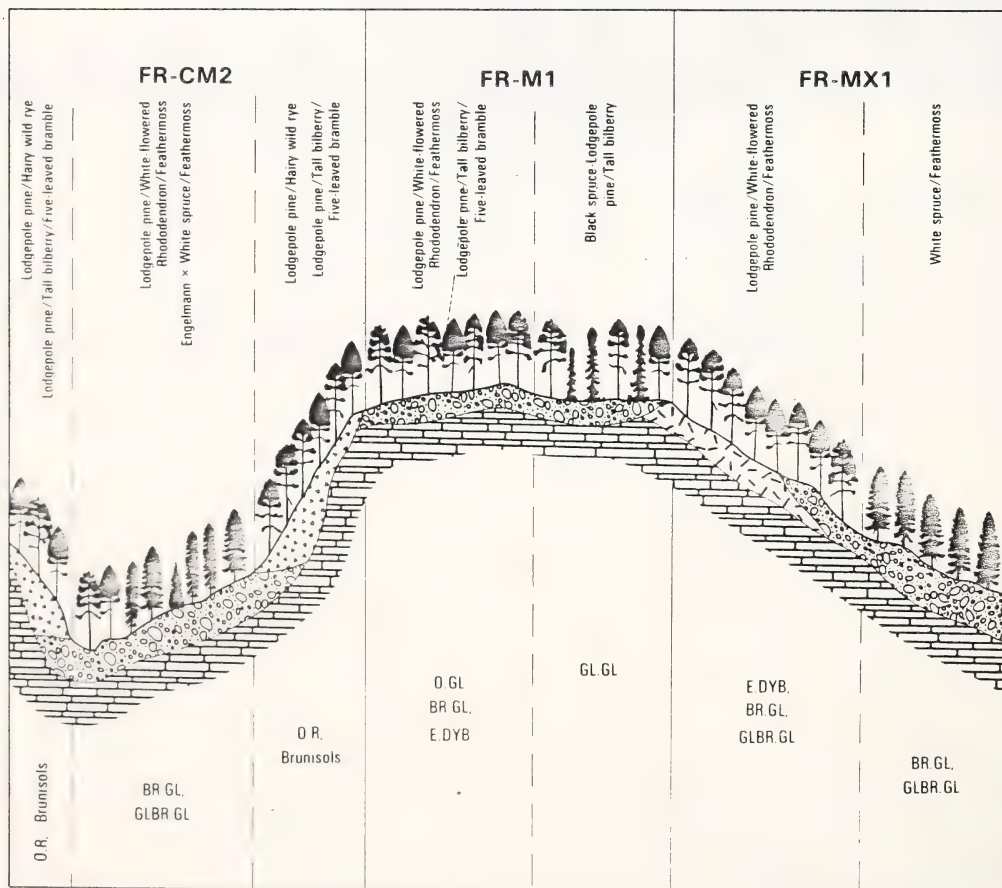


Figure 133: Schematic Diagram of Ecosections FR-CM2, FR-M1 and FR-MX1

FR-GF1

Physical Conditions:

Located along the north side of the Kakwa River between the outlets of Hat and Chicken Creeks, this system consists of a well to poorly drained glaciofluvial terrace (Figure 134). Surface expression is inclined to terraced. Coarse textured glaciofluvial sands overlie glaciolacustrine sediments at depth.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
GF, Fv GF	S-gS	2-5	2-3	E.EB, BR.GL	Lodgepole pine/Labrador tea/ Feathermoss Aspen/Buffaloberry/Showy Aster
Ov GF	Mesic S	0-2	5-6	Peaty Gley- sols	Black spruce/Cloudberry/Sphagnum Dwarf birch/Sedge/Sphagnum

Ecoregion: Boreal Uplands

Ecological Conditions

About half of this eroded terrace is forested with lodgepole pine on gravel ridges and aspen-balsam poplar on alluvial fan deposits. Dwarf birch shrubland and open black spruce forest occurs on the remainder, which is poorly drained.

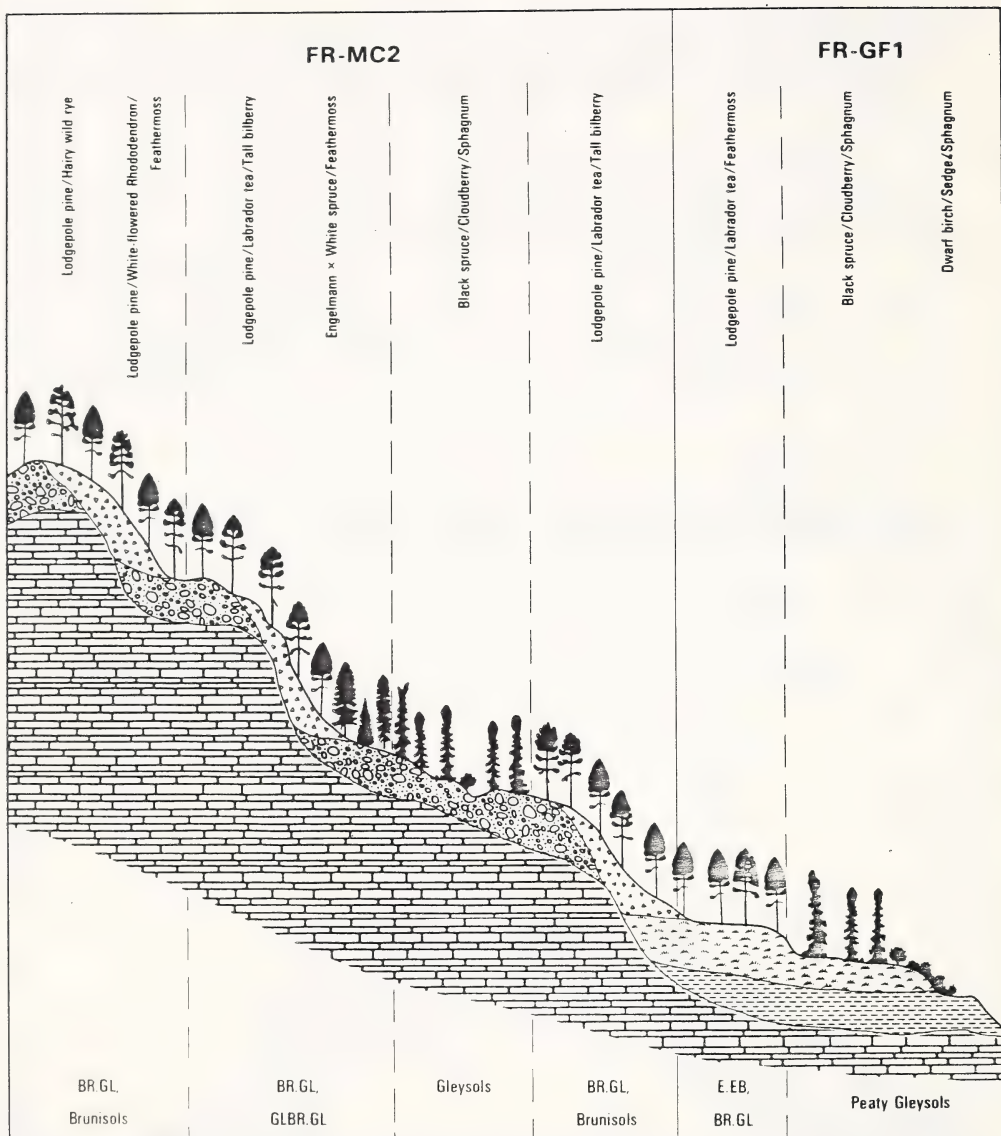


Figure 134: Schematic Diagram of Ecosections FR-GF1 and FR-MC2

Physical Conditions:

Located on the dip slope of the Nose Mountain escarpment, this system consists of moderately sloping, medium to moderately fine-textured till deposits overlying bedrock (Figure 131). Residual sandstone materials are commonly exposed where morainal materials have been washed off. The surface expression is inclined. Groundwater seepage is pronounced across much of the area.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mvb R	SL-L	2-15	2-3	BR.GL, E.DYB	Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir White-flowered rhododendron
			4-5	GLBR.GL, Gleysols	Black spruce-Lodgepole pine/Tall bilberry Engelmann spruce-Subalpine fir/ White-flowered rhododendron

Ecoregion: Subalpine

Ecological Conditions

The prevalence of seepage causes Engelmann spruce-Subalpine fir forest to cover a large portion of this landscape. Lodgepole pine forest is found on better drained subdued ridges, and a mixture of black spruce-lodgepole pine forest and dwarf birch shrubland is found on larger seepage tracks at the base of slopes.

Physical Conditions:

Located between Prairie Creek and the Smoky River, this system is dissected by northeast trending upper tributary streams of Prairie Creek (Figure 135). Surface expression is inclined and ridged with the overall topography sloping to the northeast. Slopes vary from gentle to very strong. The cuesta-like ridge which forms the southern boundary of this ecosection acts as a drainage divide which separates the Smoky from the Kakwa River watersheds.

Surficial deposits include medium to moderately fine textured till overlying bedrock. Where Continental tills have been eroded by fluvial action, residuum is exposed. In lower valley positions, medium to coarse-textured fluvial veneers derived from slope wash overlie ground moraine.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}, \frac{Xv}{R}$	SL-SICL	16-45	2-3	BR.GL, O.GL	Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ White-flowered rhododendron
$\frac{Fv}{M}$	S-L	6-15 0-5	2-3 5-6	BR.GL Peaty Gleysols	Lodgepole pine/Tall bilberry/Five-leaved bramble Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

Approximately 2/3 of this ecosection is forested, with lodgepole pine forest restricted to ridgetops and extensive Engelmann spruce-subalpine fir forests on gentle to side slopes. Dwarf birch shrublands predominate on poorly drained valley bottoms, but grassland also occurs on deep sandy slope wash deposits.

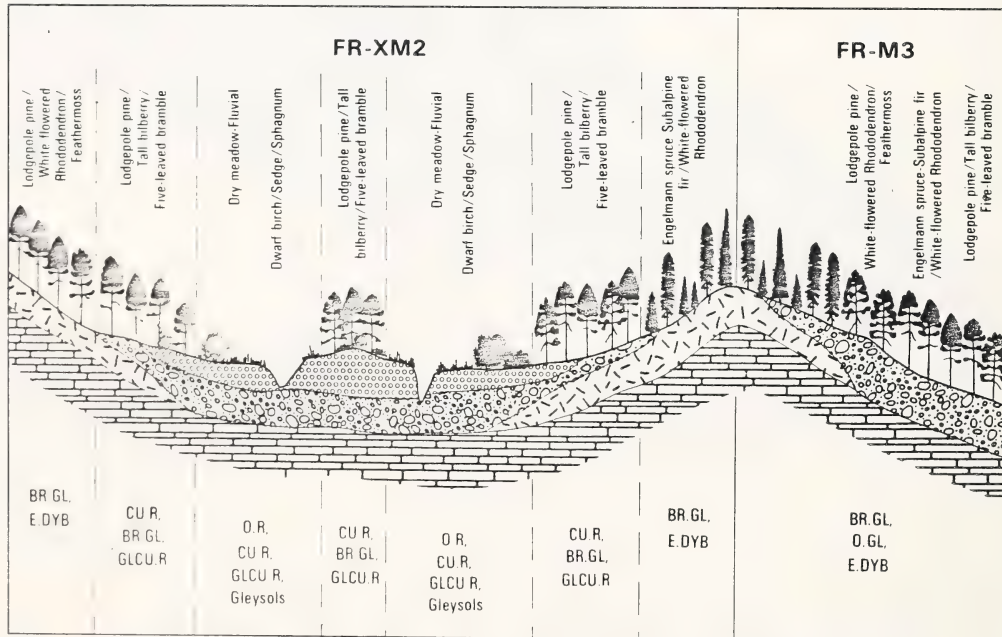


Figure 135: Schematic Diagram of Ecosections FR-M3 and FR-XM2

Physical Conditions:

Occupying the northeast facing slopes south of the Kakwa River, this extensively dissected system (Figure 136) consists of a complex of medium to moderately fine-textured Cordilleran tills and colluvium overlying bedrock. Residual sandstone materials are commonly exposed where tills have been eroded away. The surface expression is inclined to ridged with some subdued topography.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	L-SiCL	6-30	3-4	BR.GL GLBR.GL	Lodgepole pine/Labrador tea/ Tall bilberry White spruce/Feathermoss
$\frac{Xvb, Cvb}{R}$	SL	6-70	2-3	BR.GL, E.EB	Engelmann x White spruce/ Feathermoss Lodgepole pine/White-flowered rhododendron

Ecoregions: Subalpine
Boreal Uplands

Ecological Conditions

Much of this ecosection has been burned and currently supports seral deciduous shrubland, especially on upper slopes. Engelmann spruce-Subalpine fir forest is common in unburned ravines on upper slopes, while lower slopes support lodgepole pine forest.

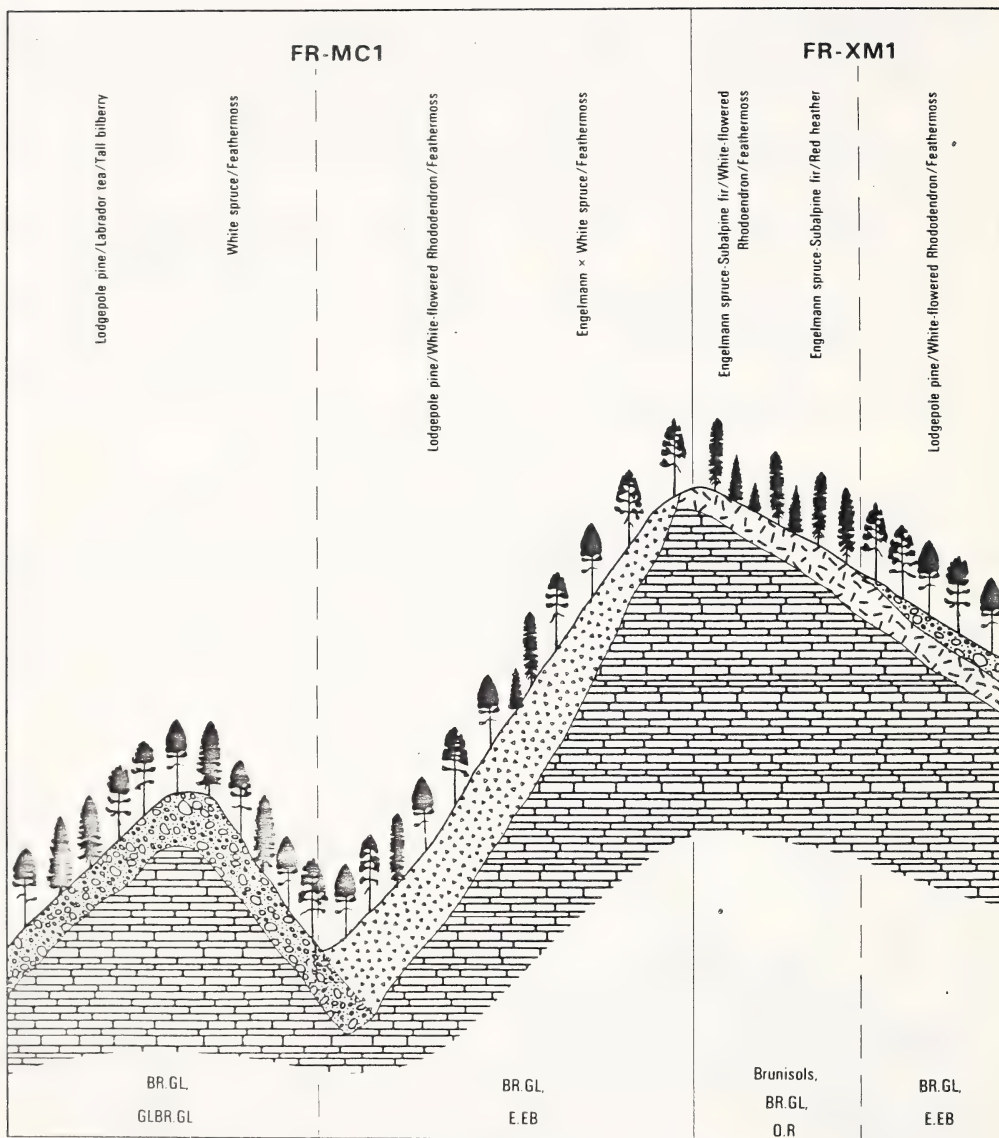


Figure 136: Schematic Diagram of Ecosections FR-MC1 and FR-XM1

Physical Conditions:

The eroded valley of Chicken Creek consists of gullied and slumped terrain (Figure 134) with a mixture of colluvium and residual materials overlying soft Cretaceous bedrock on upper slopes, and thicker tills and organic deposits on lower slopes and the valley floor. Upper slopes are subdued to rolling, while mid-slopes are inclined to ridged. Deposits of till and alluvial fans occur on lower slopes.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	SL-SiCL	2-15	2-3	BR.GL	Lodgepole pine/Labrador tea-Tall bilberry Aspen/Buffaloberry/Aster
			3-4	BR.GL, GLBR.GL	White spruce/Feathermoss
			5	Gleysols	Black spruce/Horsetail/Sphagnum Dwarf birch/Sedge/Sphagnum
$\frac{Cv}{M}$	$\frac{SL}{SiCL}$	6-45	3	BR.GL, Brunisols	Lodgepole pine/Labrador tea-Tall bilberry Lodgepole pine/White-flowered rhododendron/Feathermoss Engelmann x White spruce/Feathermoss
$\frac{Cvb}{R}$	SL-SiCL	31-70	2-3	Brunisols	Lodgepole pine/White-flowered rhododendron/Feathermoss Lodgepole pine/Hairy wild rye

Ecoregion: Subalpine
Boreal Uplands

Ecological Conditions

The predominant upland vegetation is a mixture of lodgepole pine forest on ridge crests and spruce-fir forest on side slopes that is typical of the Subalpine and Boreal Uplands ecoregions. Poorly drained bottoms of tributary valleys support a mixture of black spruce forest and dwarf birch shrublands. Aspen forest is restricted to the steepest, predominantly south-facing, slopes adjacent to Chicken Creek.

Physical Conditions:

This system consists of a series of sloping ridges on the northeast side of Morley Hill which have been produced by headwater erosion by unnamed tributaries of the Kakwa River (Figure 133). The surface expression is inclined and ridged, with slopes varying from gentle to strong. Surficial materials include medium to moderately fine textured Continental till, with residual sandstone materials found on upper slopes. Minor amounts of slumping have occurred on side slopes.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOIL	PLANT ASSOCIATION
Mv, Xv R R	SiL-SL	2-15	3-4	E.DYB, BR.GL, GLBR.GL	Engelmann x White spruce/Feather- moss Lodgepole pine/White-flowered rhododendron/Feathermoss

Ecoregion: Subalpine

Ecological Conditions

The vegetation pattern is controlled by topography, soil depth and availability of soil moisture, with lodgepole pine forest on ridge tops and upper slopes and Engelmann spruce-Subalpine fir forest on lower slopes and valley bottoms. The relatively steep slope of tributary valley floors improves drainage and prevents the development of dwarf birch shrubland that characterizes nearby ecosections.

Physical Conditions:

This system is a highly dissected upland plateau surrounding the headwaters of Nose Creek (Figure 132). Surface expression varies from inclined to ridged along the western side (Hat Mountain) of the ecosection to subdued and rolling on its eastern side. Slopes range from gentle in the east to very strong in the west, especially in the vicinity of Hat Mountain. Deposits are dominantly a mixture of moraine and residual sandstones overlying bedrock, with a gradual increase in the thickness of moraine from west to east. Till deposits in the east are finer-textured and less stony than those in the west. Bedrock outcrops and thin residual materials are more prominent in the Hat Mountain area.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mv}{R}$	L-SiCL	2-15	2-3	BR.GL, O.GL	Lodgepole pine/White-flowered rhododendron Engelmann x White spruce/White-flowered rhododendron
		0-2	4-5	Gleysols	Dwarf birch/Sedge/Sphagnum
$\frac{Xv}{R}$	L-SL	9-45	2-3	E.DYB,	Lodgepole pine/White-flowered/rhododendron Engelmann spruce-Subalpine fir/Red heather

Ecoregion: Subalpine

Ecological Conditions

Elevation has an influence on the vegetation pattern in this ecosection, with Engelmann spruce-Subalpine fir predominant at highest elevations in the western portion, and lodgepole pine forest becoming more common toward the east. Forest stands on ridge tops often have an open, stunted canopy because of high winds and thin soils.

Physical Conditions

This is a gently inclined upland area centered around Copton Ridge (Fig. 136). Rolling to undulating surface expression predominates at upper elevations, while lower elevations have been highly dissected by headwater streams. Surficial materials include moderately coarse to moderately fine-textured residual sandstone materials, overlain by thin discontinuous deposits of Cordilleran till.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Xvb}{R}$, $\frac{Mv}{R}$	SL-SiL	2-30	2	Brunisols, O.R, BR.GL	Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ White-flowered rhododendron Engelmann spruce-Subalpine fir/Red heather

Ecoregion: Subalpine

Ecological Conditions

Extensive portions of this ecosection have been burned and currently support young seral lodgepole pine stands. The composition of mature forest reflects elevation and thus climate, with lodgepole pine forest predominating below 1370 m in the northern part of the ecosection and Engelmann spruce-Subalpine fir forest at higher elevation. At the highest elevations, the tree canopy is stunted and open because of high winds and thin soils.

Physical Conditions

This system is the dip slope of a cuesta-like ridge which separates the Smoky and Kakwa river drainage systems (Figure 135). Tributaries of Prairie Creek have dissected the lower slopes of this northeast-dipping basin.

A complex association of surficial deposits is found within the system. Upland areas are dominated by residual sandstone materials and thin deposits of moraine. Morainal deposits become thicker toward the east. Fluvial veneers derived from slope wash overlie moraine on lower slopes. Gleysols and thin organic deposits are found in discharge areas on lower slopes.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Xv}{R}, \frac{Mv}{R}$	SiL-L	2-15	2-3	BR.GL, E.DYB	Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ White-flowered rhododendron
$\frac{Fv}{M}$	$\frac{S}{STL}$	0-5	3-5	O.R, CU.R, GLCU.R, Gleysols	Dry meadow-Fluvial Dwarf birch/Sedge/Sphagnum
$\frac{Xvb}{R}, \frac{Mvb}{R}, \frac{Fv}{M}$	S-L	0-15	2-4	CU.R, BR.GL, GLCU.R	Lodgepole pine/Tall bilberry/Five-leaved bramble

Ecoregion: Subalpine

Ecological Conditions

A distinctive vegetation pattern is produced by the occurrence of sandy veneers and poorly drained valley bottoms in the northwestern portion of the ecosection. A mixture of grassland and deciduous shrubland communities predominates in this area of highly variable drainage. Lodgepole pine forest is confined to subdued ridges. The southeastern portion of the ecosection supports a mixture of lodgepole pine and Engelmann spruce-subalpine fir forest.

2.3.3 Kakwa Foothills Subregion (Ecodistrict)

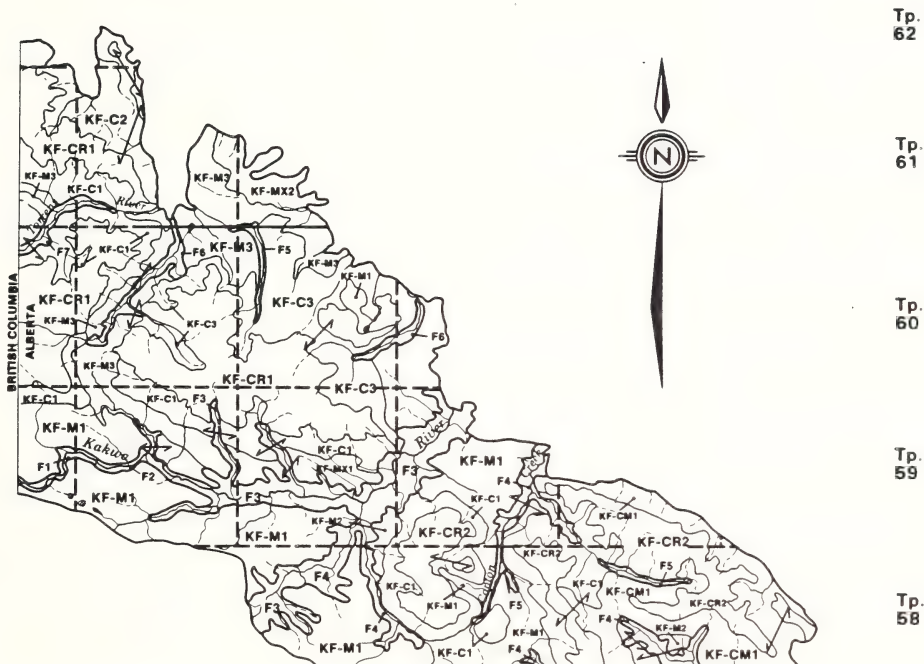
The Kakwa Foothills are located in the southwestern portion of the study area adjacent to the Rocky Mountains (Figure 137). The subregion consists of a series of subparallel, highly folded and faulted bedrock ridges and glacially sculptured valleys that are presently occupied by the Kakwa and Torrens Rivers and their tributaries. The underlying bedrock consists primarily of sandstones and shales of the Alberta and Blairmore groups and of the Nikanassin Formation. Highly resistant conglomerate of the Cadomin Formation forms a cap rock on many of the ridges and contributes to their resistance to erosion. Relief across much of the landscape is extreme with elevations ranging from 1 200 m along the Kakwa River to 2 340 m on Coal Ridge.

Cordilleran till and colluvium are the dominant surficial materials in the subregion. The till deposits are found along the valleys and on top of the plateaus. At low elevations, highly compacted basal tills are present. Most steep slopes are covered with colluvium and avalanche tracks are common. Bedrock is generally exposed on the upper portions of high ridges.

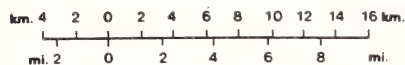
The Kakwa Foothills occur mainly within the Subalpine ecoregion, with barren ridge tops falling within the Alpine ecoregion.

Lodgepole pine forests are found at lower elevations, while Engelmann spruce-subalpine fir occur at higher elevations. Often, aspect will alter this pattern locally. The high ridges in the Alpine Ecoregion support a mixture of sedge meadows, shrublands and herblands, but are generally sparsely vegetated.

R.14 R.13 R.12 R.11 R.10 R.9



SCALE 1 : 400 000



West of the Sixth Meridian

Figure 137: Kakwa Foothills Subregion (KF)

The subregion has been divided into eleven section/systems which are described following Table 26. In addition, eight fluvial systems were identified (F1, F2, F3, F4, F5, F6, F7, F14) and are described in Section 2.5 of Volume I.

Table 26

SUMMARY OF ECOSECTIONS IN THE KAKWA FOOTHILLS SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
KF-C1	Steep side slopes	Thin, medium-textured colluvium with bedrock outcrops	Engelmann spruce-Subalpine fir and Lodgepole pine forest
KF-C2	Steep upper slopes and undulating lower slopes	Thin, medium-textured colluvium and till	Lodgepole pine and Engelmann spruce-Subalpine fir forest, Dwarf birch shrublands
KF-C3	Ridged and gullied strong slopes	Thin, moderately-fine textured colluvium	Engelmann spruce-Subalpine fir and Lodgepole pine forest
KF-CM1	Steep, ridged lower slopes	Thin, medium-textured till and colluvium	Engelmann spruce-Subalpine fir and Lodgepole pine forest
KF-CR1	Steep mountain tops	Thin, moderately fine-textured colluvium and bedrock	Alpine meadows, Engelmann spruce-Subalpine fir forest
KF-CR2	Steep mountain tops	Thin, medium-textured colluvium and bedrock	Alpine meadows and krummholz
KF-M1	Rolling to ridged lower slopes	Moderately coarse-textured till and peat	Engelmann spruce-Subalpine fir forest and Dwarf birch shrubland
KF-M2	Undulating to ridged benchland	Medium-textured till	Lodgepole pine forest and Dwarf birch shrubland
KF-M3	Inclined to rolling lower slopes	Thin, medium-textured till and residual materials	Lodgepole pine and Engelmann spruce-Subalpine fir forest
KF-MX1	Subdued ridge	Medium-textured till and residual materials	Lodgepole pine and Engelmann spruce-Subalpine fir forest, Dwarf birch shrubland
KF-MX2	Undulating to rolling plateau	Medium-textured residual materials overlain by thin till	Lodgepole pine and Engelmann spruce-Subalpine fir forest

Physical Conditions:

Occurring throughout the Kakwa Foothills on strongly to extremely sloping terrain below the treeline, this system consists of colluvial materials of variable thickness overlying bedrock (Figure 138). Colluvium is derived from disintegrated sandstones and shales. Surface expression is inclined, steep and ridged. Conglomerate erratics and bedrock outcrops are common.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	rSiL-rSL	16-70	1-3	O.R, Brunisols	Engelmann spruce-Subalpine fir/ White-flowered rhododendron Engelmann spruce-Subalpine fir/Red heather Lodgepole pine/White-flowered rhododendron Lodgepole pine/Hairy wild rye

Ecoregion: Subalpine

Ecological Conditions

Exposure is the major ecological influence on these steep slopes, with lodgepole pine forest on south-facing slopes and a mixture of lodgepole pine and Engelmann spruce-Subalpine fir on neutral and north-facing areas. Upper slopes are often non-vegetated as a result of thin soils and avalanches.

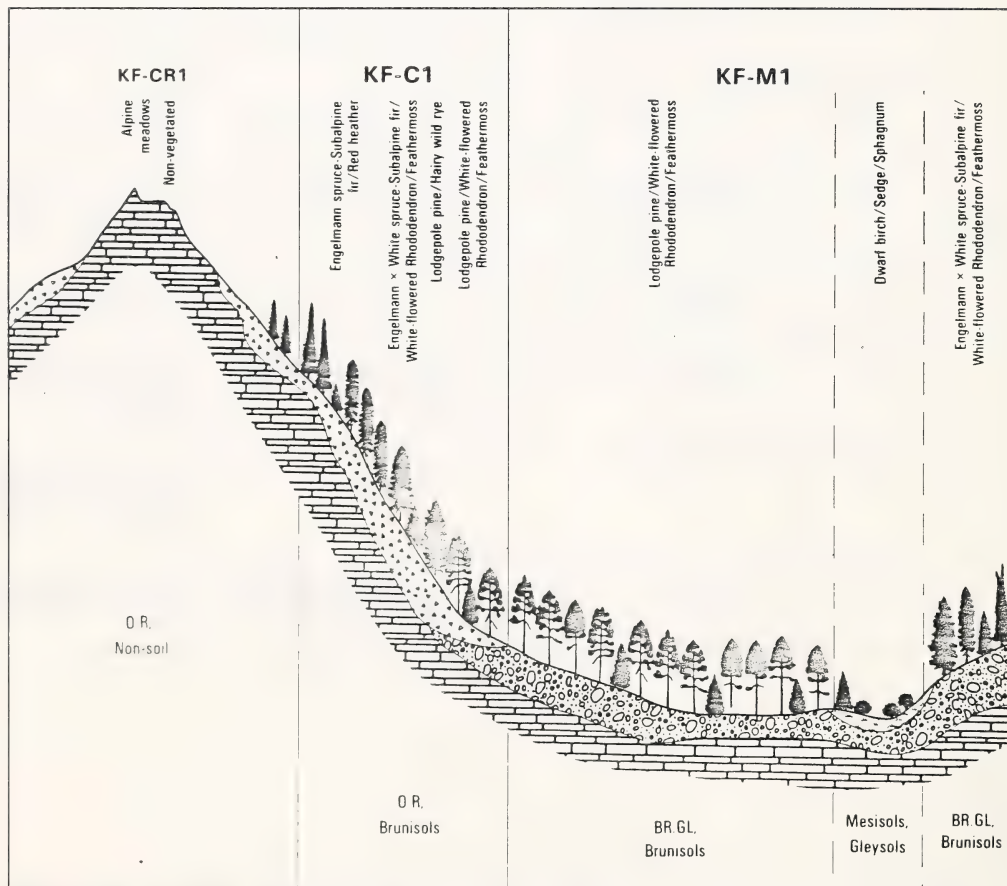


Figure 138: Schematic Diagram of Ecosections KF-C1 and KF-M1

Physical Conditions:

This system is situated between Torrens Ridge and the Narraway River and consists of active and inactive colluvium derived from Cordilleran tills, residual materials and disintegrated bedrock (Figure 142). Colluvial materials overlying bedrock are the principal surficial materials, however, morainal "islands" occur sporadically on lower slope positions. Surface expression ranges from inclined and steep on upper slopes to undulating and subdued on lower slope positions.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	rSiL-SL	31-70	1-3	O.R, Bruni-sols	Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ White-flowered rhododendron Engelmann spruce-Subalpine fir/Red heather
		16-30	4-5	GLBR.GL, Gleysols	Engelmann x white spruce/ Feathermoss Dwarf birch/Sedge/Sphagnum
$\frac{Mb}{R}$	SiL-SiCL	16-30	2-3	BR.GL	Lodgepole pine/Tall bilberry/ Five-leaved bramble

Ecoregion: Subalpine

Ecological Conditions

Elevation, a downslope increase in soil thickness and local variation in drainage produce the vegetation pattern. Open Engelmann spruce-Subalpine fir forests predominate at high elevations where soils are thin. Lower elevation support a mixture of spruce-fir and lodgepole pine forest, while dwarf birch shrubland is found on poorly drained valley bottoms.

Physical Conditions:

Bounded on the east by Lynx Creek and on the west by Lick Creek, this system consists of moderate to very strongly sloping upland areas and side slopes (Figure 139). Colluvial materials are derived from Cordilleran tills, residuum and disintegrated bedrock of the Shaftsbury Formation. Surface expression varies from inclined and ridged to steep and gullied, with slumping and bedrock outcrops common.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
<u>Cvb</u> R	rCL-rSiL	16-45	1-3	O.R, Bruni- sols	Lodgepole pine/White-flowered rhododendron Lodgepole pine/Hairy wild rye Engelmann spruce-Subalpine fir/ White-flowered rhododendron Engelmann spruce-Subalpine fir/Red heather Subalpine grassland

Ecoregion: Subalpine

Ecological Conditions

Lodgepole pine forest covers most of this ecosection, with Engelmann spruce-Subalpine fir stands confined to tributary valleys and lower slopes where soils are thicker and the soil moisture regime more favorable. Steep upper, south-facing slopes are extremely dry and support grassland communities.

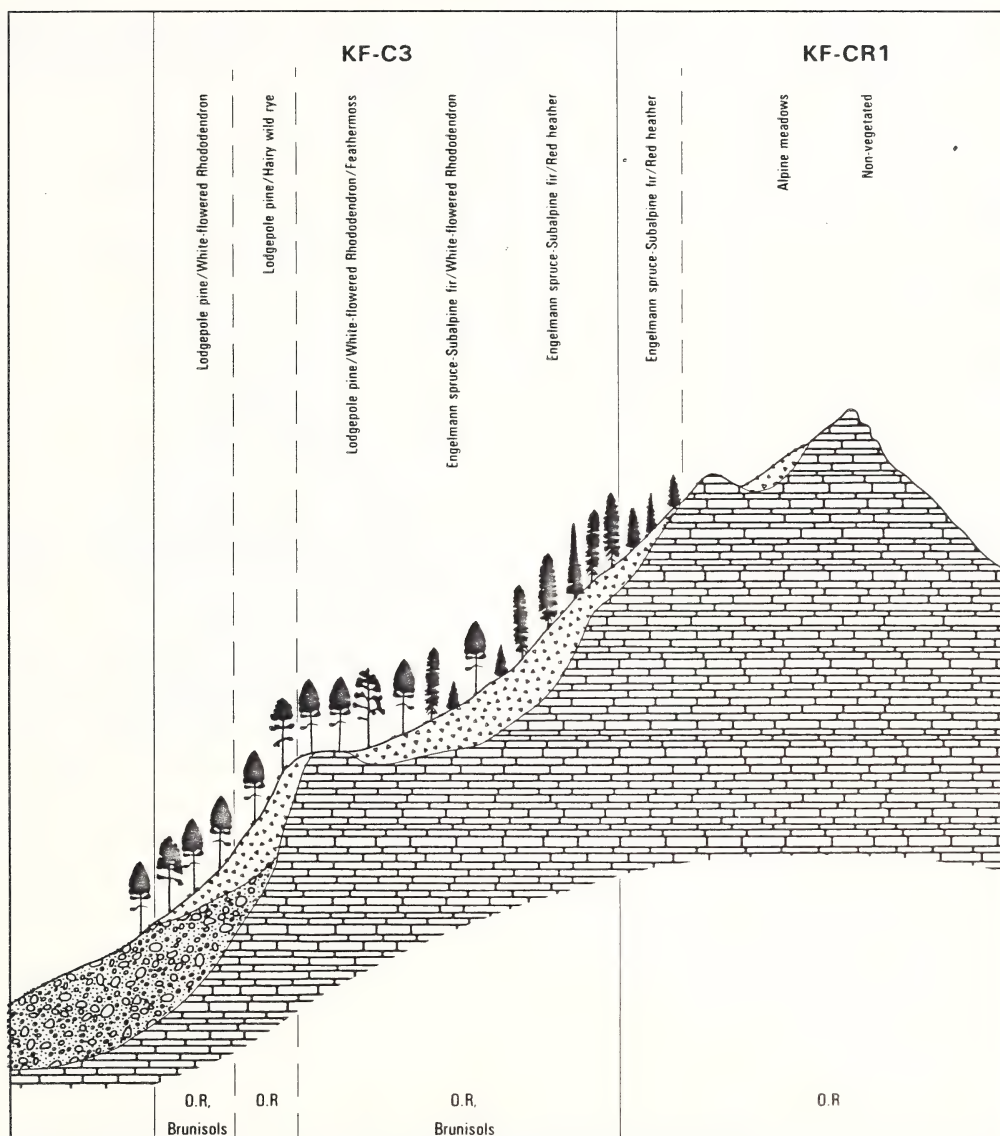


Figure 139: Schematic Diagram of Ecosections KF-C3 and KF-CR1

Physical Conditions:

Occupying the lower slopes of the rugged terrain centered around Caw and Nickerson Creeks, this system consists chiefly of colluvial materials of various thickness overlying bedrock (Figure 140). Bedrock exposures are common on upper slopes. Thin Cordilleran till and residuum occur locally and account for approximately 25% of surficial materials. Topography across the ecosection is moderate to very strongly sloping with a dominantly inclined and ridged surface expression.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	rSiL-SL	16-45	1-2	O.R, Brunisols	Engelmann spruce-Subalpine fir/ White-flowered rhododendron Lodgepole pine/Hairy wild rye
$\frac{Mv}{R}$	SiL	9-30	2-3	Brunisols, BR.GL	Engelmann spruce-Subalpine fir/ White-flowered rhododendron Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ Red heather

Ecoregion: Subalpine

Ecological Conditions

Elevations greater than 1 680 m cause Engelmann spruce-Subalpine fir forest to cover most of these slopes. Canopies tend to be open on upper slopes because of thin soils and the extreme climate. Lodgepole pine forest occurs at lower elevations but is not extensive.

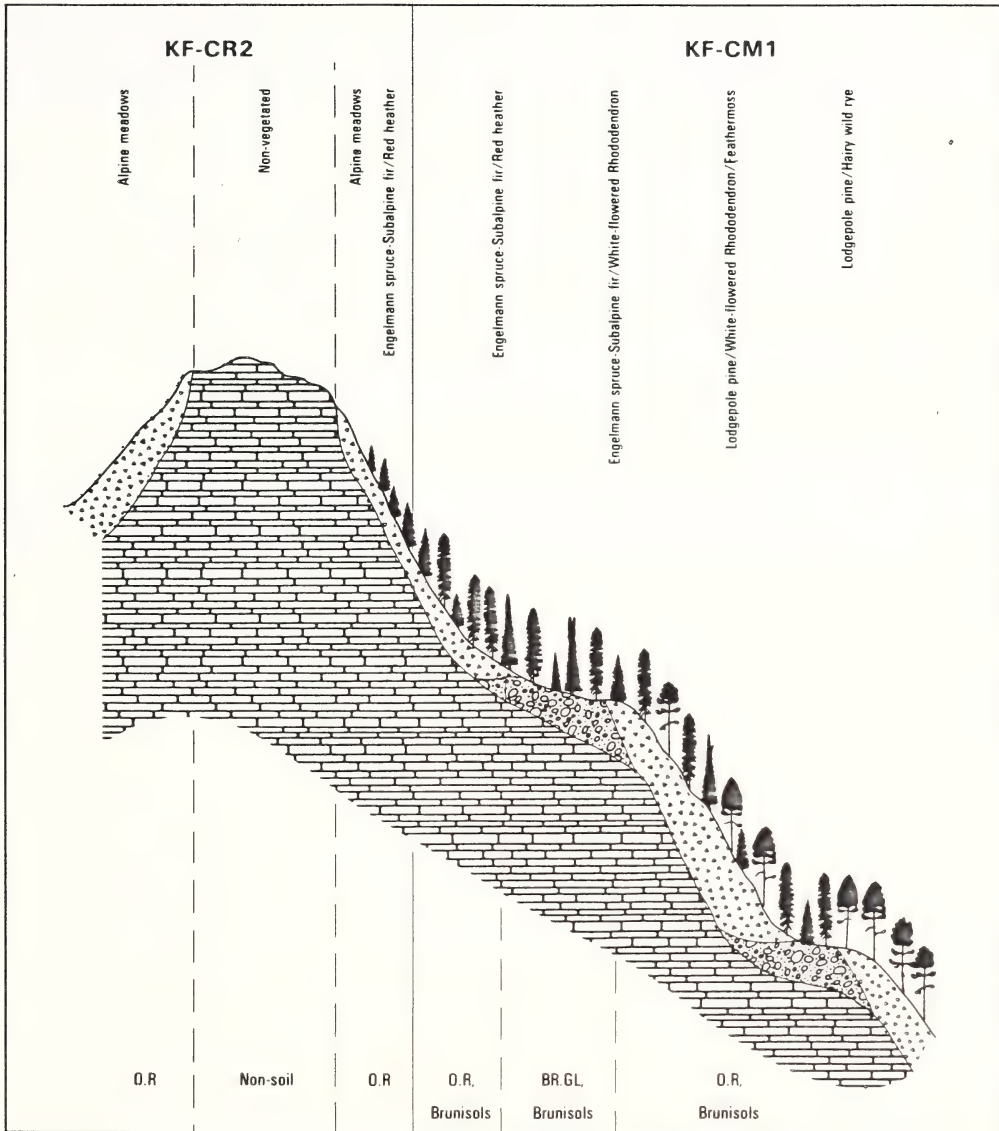


Figure 140: Schematic Diagram of Ecosystems KF-CM1 and KF-CR2

Physical Conditions:

Centered around Torrens, Dinosaur, Horn and Coal Ridges and a large unnamed ridge complex north of the Kakwa River valley, this system consists of thin colluvial veneers over bedrock with extensive areas of bedrock outcropping (Figure 139). The topography is very rugged with surface expression generally steep, inclined and ridged. Glacially sculpted features like cirques and aretes, and periglacial features such as stone stripes and nets are common. Slopes vary from very strong to very steep. Most of the bedrock is hard marine quartzitic sandstone which is relatively resistant to weathering, so slumping is not common.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Cv R	SiLR-rCL	31-100	1-2	O.R	Engelmann spruce-Subalpine fir/Red heather
R		70-100		Non-soil	Non-vegetated

Ecoregions: Subalpine
Alpine

Ecological Conditions

This ecosection is characterized by a harsh climate and thin soils, and exposure has a major influence on the distribution of vegetation types. Engelmann spruce-Subalpine fir forest is confined to northern exposures because of later snowmelt and a more favorable soil moisture regime. Southern and neutral exposures are often non-vegetated near ridge crests, while lower slopes support alpine meadow vegetation.

KF-CR2

Physical Conditions

Occurring southeast of the Kakwa River, this system consists of thin colluvial materials overlying bedrock with extensive areas of bedrock outcrops (Figure 140). Surface expression is inclined to steep producing a less rugged and more subdued topography than in KF-CR1. Glacially sculpted features are less common. Ridges are not as prominent and peaks tend to be more rounded. Elevations across the ecosection are much lower than in KF-CR1, with the highest peak being 2 072 m in elevation.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOIL	PLANT ASSOCIATION
Cv R	SiLr-rCL	31-70	1-2	O.R	Alpine meadows Engelmann spruce-Subalpine fir/ Red heather
R		46-70		Non-soil	Non-vegetated

Ecoregion: Alpine
Subalpine

Ecological Conditions

Alpine meadows occur over most of this ecosection, with bare rock outcrops found near ridge crests. Despite less rugged topography and lower elevations than KF-CR1 forest development is more restricted, with open Engelmann spruce-Subalpine fir stands occurring spottily in subdued headwater valleys.

Physical Conditions

This system occurs within the Kakwa River valley and parallels the Park Ranges subregion (Figure 138). It also occurs on the upland area east of the South Kakwa River and extends eastward to Copton and Horn Creeks. Thick morainal deposits of local origin are the principal surficial materials across most of the ecoregion. Organic accumulations of sphagnum peat occur in minor glacial meltwater channels and account for approximately 10% of all surficial materials. Fluvial veneers derived from slope wash commonly overlie morainal deposits adjacent to steep slopes (PR-C1, KF-C1). Surface expression varies from level and undulating to ridged and steep with rolling to inclined surface expressions dominating. Slopes vary from nearly level to strong.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mb}{R}$	rL-gSL	2-30	2-3	Brunisols, BR.GL	Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ White-flowered rhododendron
$\frac{Ov}{R}$	Mesic- Fibric	0-2	5-6	Peaty Gley- sols, Fibri- sols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

The presence of glacial meltwater channels and bedrock ridges creates extreme variation in drainage condition which is reflected in the vegetation pattern. Ridges and slopes are forested with lodgepole pine on relatively level sites and ridge tops, and Engelmann spruce-Subalpine fir on sloping terrain. This segregation may reflect differences in soil depth, with pine stands occurring on thinner soils. Poorly drained meltwater channels and low-lying areas between ridges support dwarf birch shrublands.

Physical Conditions

This bedrock controlled system is located immediately adjacent to Falls and Nickerson Creeks and is an undulating bench separating steeper upper and lower slopes (Figure 141). Cordilleran till overlies bedrock of the Shaftsbury Formation. Fluvial veneers derived from slope wash commonly overlie morainal deposits and thin organic deposits are common between ridges.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	SiL-SiCL	2-30	2-3	E.DYB, BR.GL	Lodgepole pine/White-flowered rhododendron Feathermoss
			5	Peaty Gleysols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

Lodgepole pine forests predominate on well-drained ridges with deciduous shrublands found in poorly drained tributary valley bottoms.

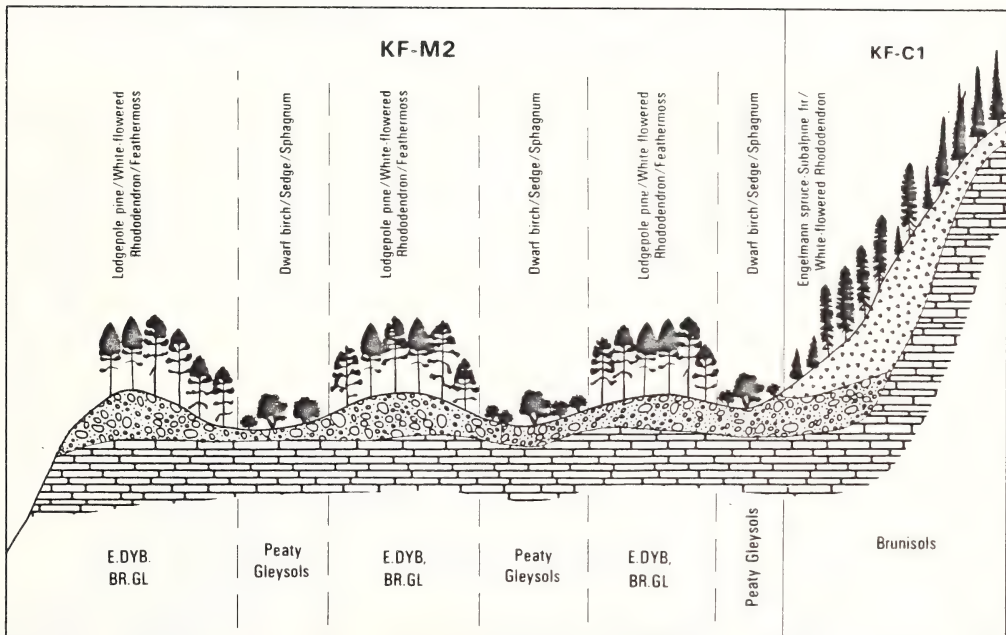


Figure 141: Schematic Diagram of Ecosection KF-M2

Physical Conditions

This system includes the lower valley slopes of the Torrens and South Torrens Rivers and Stinking, Mouse Cache and Lick Creeks (Figure 142). Surficial materials include Cordilleran tills overlying bedrock with a substantial amount of residuum occurring where bedrock is close to the surface. Wet and dry meadows occur adjacent to Mouse Cache Creek. Surface expression is dominantly inclined to rolling with slopes ranging from moderate to very strong.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mvb R	rL-rSL	10-45	2-3	Brunisols, BR.GL	Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ Feathermoss

Ecoregion: Subalpine

Ecological Conditions

Exposure and soil depth influence forest composition in this ecosection. Lodgepole pine occurs on ridge tops and south-facing slopes, while Engelmann spruce-Subalpine fir forest is found on northern exposures. Wet and dry meadows are intermixed with open pine stands on gentle slopes adjacent to Mouse Cache Creek. The lack of continuous forest cover is probably a reflection of coarse surficial deposits derived from slope wash.

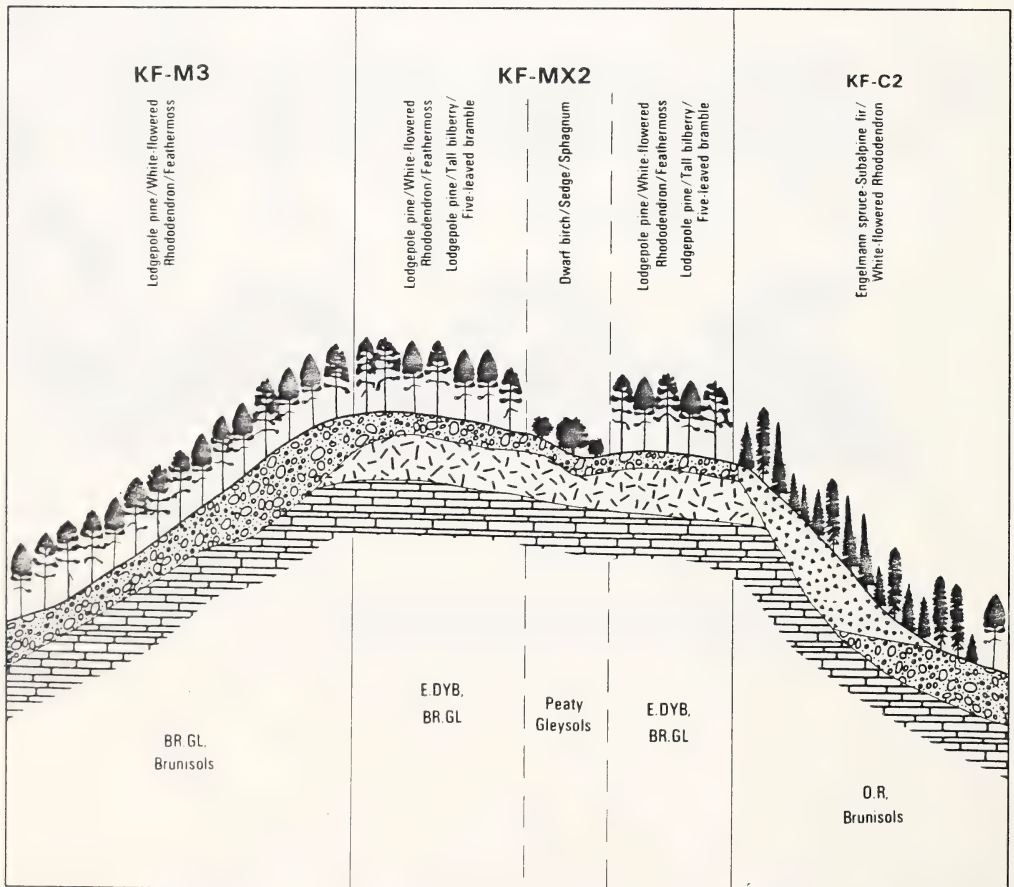


Figure 142: Schematic Diagram of Ecosections KF-M3 and KF-MX2

Physical Conditions

This system is a subdued ridge with adjacent slopes, located between Lynx Creek and the Kakwa River (Figure 143). Cordilleran till covers most of the system, with residual materials exposed on ridge tops. A few organic deposits are found in groundwater discharge areas between ridges. Slopes vary from moderate to very strong.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Mvb}{R}$	rL-gSL	16-45	2-3	Brunisols, BR.GL	Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ White-flowered rhododendron
$\frac{Xvb}{R}$	rL-gSL	9-30	2-3	Brunisols	Lodgepole pine/Hairy wild rye Lodgepole pine/White-flowered rhododendron
$\frac{Ov}{M}$	$\frac{Mesc}{rL}$	0-2	5-6	Peaty Gleysols, Mesisols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine

Ecological Conditions

Extreme variation in drainage on this ridged topography creates the vegetation pattern. Well-drained uplands are forested with lodgepole pine predominating on ridge tops, southern and neutral exposures, while Engelmann spruce-Subalpine fir is found on lower valley sides and northern exposures. Dwarf birch shrublands are found on poorly drained low-lying areas between ridges.

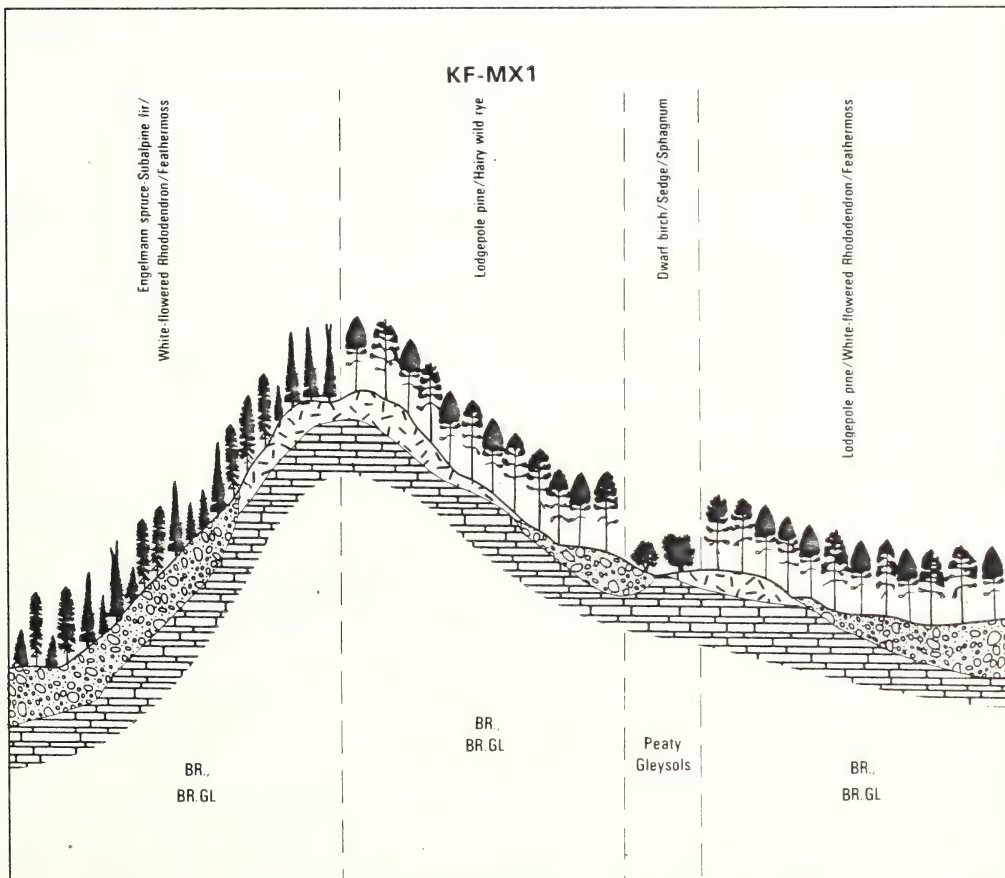


Figure 143: Schematic Diagram of Ecoregion KF-MX1

Physical Conditions

This gently undulating to rolling upland plateau located east of Sherman Meadows and north of Stetson Creek consists of residual sandstone material overlain by a thin continuous veneer of Cordilleran till (Figure 142). Thicker morainal deposits and organic accumulations occur locally. Slopes vary from gentle to strong.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mv X	rL-gSiL	6-30	2-3	E.DYB, BR.GL	Lodgepole pine/White-flowered rhododendron Feathermoss Lodgepole pine/Tall bilberry/Five- leaved bramble Engelmann spruce-Subalpine fir/ Feathermoss

Ecoregion: Subalpine

Ecological Conditions

Lodgepole pine forest covers most of this ecosection, with variation in soil thickness causing the tree canopy to vary from open on ridge tops to closed on side slopes. Small amounts of Engelmann spruce-Subalpine fir forest are found on lower slopes of tributary valleys.

2.3.4 Smoky Valley Subregion (Ecodistrict)

Located in the extreme southern portion of the study area (Figure 144), this rugged upland is traversed by the deeply incised Smoky River valley. Erosion by the Smoky River and its tributaries has created a series of northeast trending ridges as opposed to northwest trending ridges which are found elsewhere within the Rocky Mountain Foothills region. The subregion is underlain by Lower to Upper Cretaceous bedrock which has not been as distorted by folding and faulting as other subregions found within the Foothills region. Relief is not as extreme, with elevations ranging from 885 m within the Smoky River valley to 1 850 m atop Cutpick Hill.

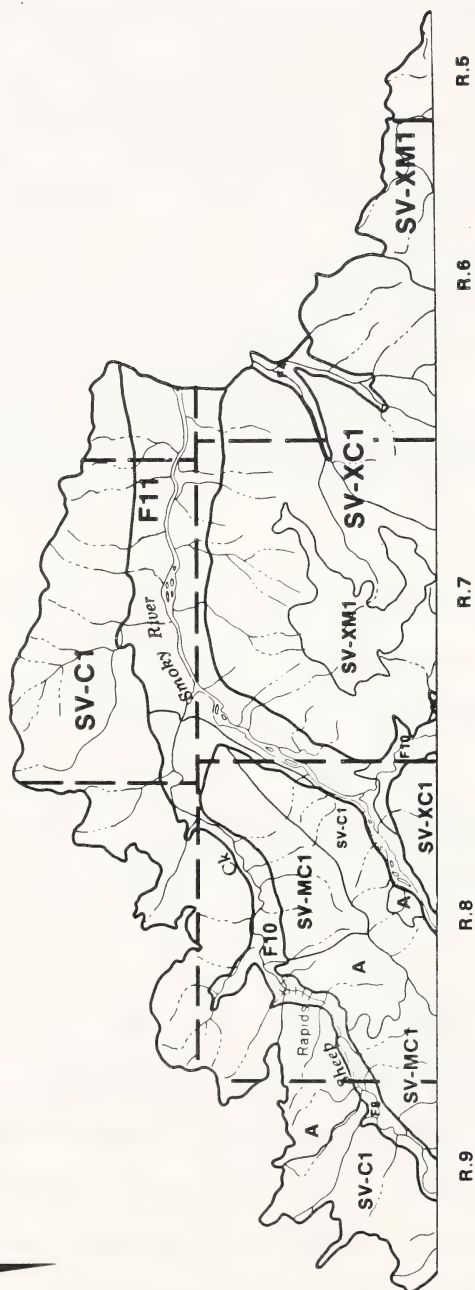
Surficial deposits within the subregion have been heavily influenced by post-glacial erosion. Hence, colluvium and residual materials are very dominant. Minor amounts of both Continental and Cordilleran till can be found on some uplands and lower slope positions where erosion has not been intense. Within the major stream valleys, glaciofluvial sands and gravels are very prominent as valley trains and terraces.

The Smoky Valley subregion comes under the influence of the Boreal Uplands, Subalpine and a variant of the Montane ecoregions. Within the river valley the combined influence of chinook winds, steep slopes and exposure have produced a dry environment allowing aspen forests and grasslands to co-exist. Elsewhere, on uplands and higher ridges, closed lodgepole pine forests with varying understories can be found. White or Engelmann spruce is found locally on northern exposures.

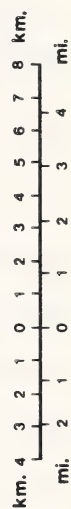


Tp.
59

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58



SCALE 1 : 200 000



West of the Sixth Meridian

Figure 144: Smoky Valley Subregion (SV)

The subregion is divided into five ecosections/systems (Table 27) which are described in more detail in the following sections.

The Smoky Valley subregion was identified as having four distinct fluvial systems (F8, F10, F11, F14). They are discussed in detail in Section 2.5 of Volume I of this report.

Table 27

SUMMARY OF ECOSECTIONS IN THE SMOKY VALLEY SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
SV-C1	Inclined to steep valley walls	Thin, medium-textured colluvium	Aspen forest, grassland and lodgepole pine forest
SV-MC1	Nearly level to rolling plateau	Moderately coarse-textured till overlain by silt	Lodgepole pine and white spruce forest
SV-XC1	Ridged and gullied upper slopes	Thin, medium-textured residual materials and colluvium	Aspen forest, grassland and lodgepole pine forest
SV-XM1	Rolling plateau remnant	Thin, moderately fine-textured residual materials and till	Lodgepole pine and black spruce-lodgepole pine forest, dwarf birch shrubland

SV-C1

Physical Conditions:

This system is made up of the moderately to steeply sloping south-facing valley walls of Sheep Creek and the Smoky River (Figure 145). Colluvium derived from till and weathered bedrock is the dominant surficial material. Gullying and slumping are common throughout the system, and bedrock is exposed on upper slopes.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Cvb R	rSiL	16-45	2-3	Brunisols, O.R	Aspen/Rose/Hairy wild rye
		45-100	1-2	O.R	Lodgepole pine/Aspen/Bearberry Grasslands

Ecoregion: Montane Variant

Ecological Conditions

Dry conditions caused by steep southern exposures and high winds in the Smoky River Valley cause small stands of aspen and grasslands dominated by june grass, wheat grass and sage to cover most of this ecosection. Lodgepole pine stands are rare and confined to gully bottoms and lower slopes.

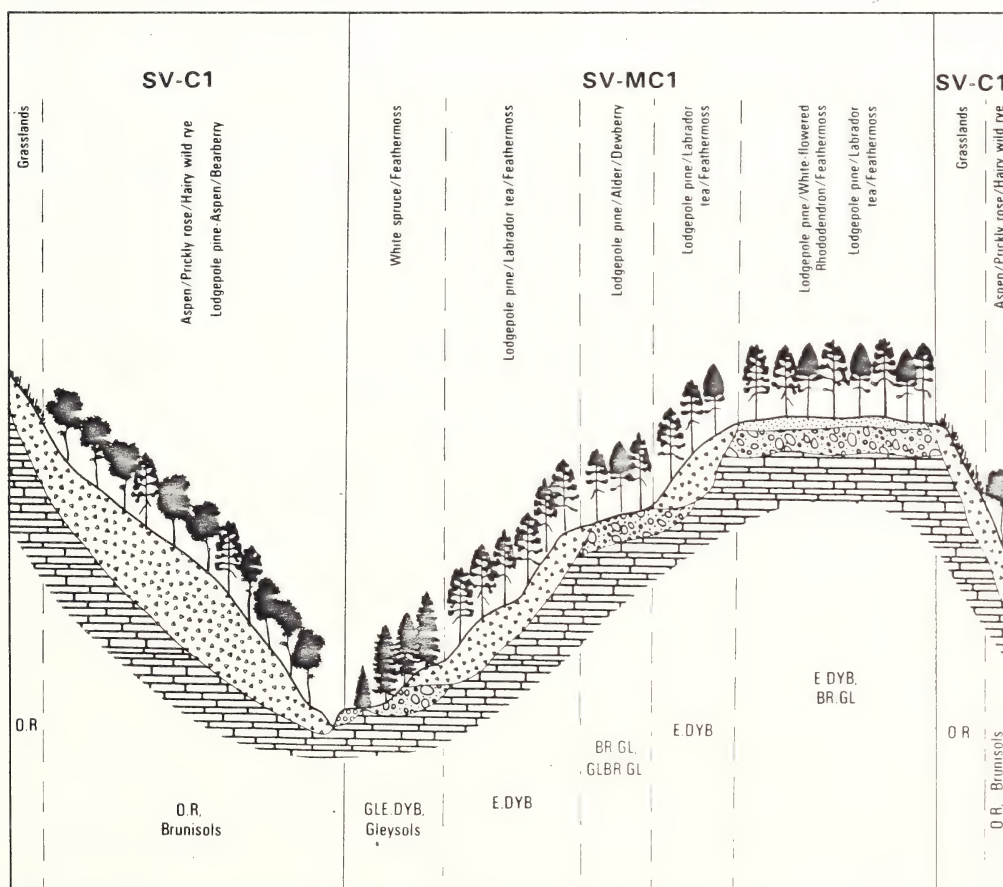


Figure 145: Schematic Diagram of Ecosections SV-C1 and SV-MC1

Physical Conditions:

Situated between the Smoky River and Sheep Creek this plateau remnant has surface expressions that vary from nearly level and subdued on upland areas to inclined and rolling on northwest facing side slopes (Figure 145). Slopes range from nearly level to very strong. On upland areas thin veneers of Cordilleran till are overlain by silty eolian veneers. A complex of colluvial and morainal materials occurs on side slopes, with morainal deposits being confined to less steep topography. Colluvial materials are derived from tills and disintegrated sandstones, siltstones and shales. A large portion of this ecosection is being mined for coal which occurs in the Luscar Formation.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Ev}{M}$	$\frac{SL}{StCL}$	0-9	1-2	E.DYB, BR.GL	Lodgepole pine/Labrador tea/ Feathermoss
$\frac{Mv}{R}$	SL-StCL	9-30	2-4	BR.GL, GLBR.GL	Lodgepole pine/Labrador tea/ Feathermoss Lodgepole pine/Alder/Dewberry
$\frac{Cv}{R}$	SL	16-45	1-3	E.DYB	Lodgepole pine/Labrador tea/ Feathermoss
			4-5	GLE.DYB, Gleysols	White spruce/Feathermoss

Ecoregion: Boreal Uplands

Ecological Conditions

Most of this ecosection is covered by lodgepole pine forest, with dry conditions due to silt deposits causing an open canopy at high elevations. White spruce forest occurs on the lower slopes and floors on tributary valleys.

Physical Conditions

Lying immediately south and east of the Smoky River and extending eastward to Wanyandie Creek, this system (Figure 146) consists of a complex association of residuum and colluvial materials derived from thin, moderately coarse to medium-textured tills and weathered sandstones and siltstones. Surface expression is inclined to ridged and gullied with slopes ranging from strong to extremely sloping.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Xvb}{R}$	SL-SiCL	16-45	2-3	BR.GL, Brunisols	Lodgepole pine/Labrador tea/Tall bilberry/Lodgepole pine/Alder/Dewberry Grasslands
$\frac{Cvb}{R}$	rSiL-SiCL	30-70	1-3	E.DYB, E.EB	Aspen/Rose/Hairy wild rye Lodgepole pine/Aspen/Bearberry White spruce/Feathermoss

Ecoregion: Montane Variant
Boreal Uplands

Ecological Conditions

Aspect and elevation are the major influences on vegetation distribution. Aspen forest occurs on lower slopes and steep southern and western exposures; grassland and aspen stands are mixed on the steepest slopes. Lodgepole pine forest is found on upper slopes, with white spruce stands in the bottoms of tributary valleys.

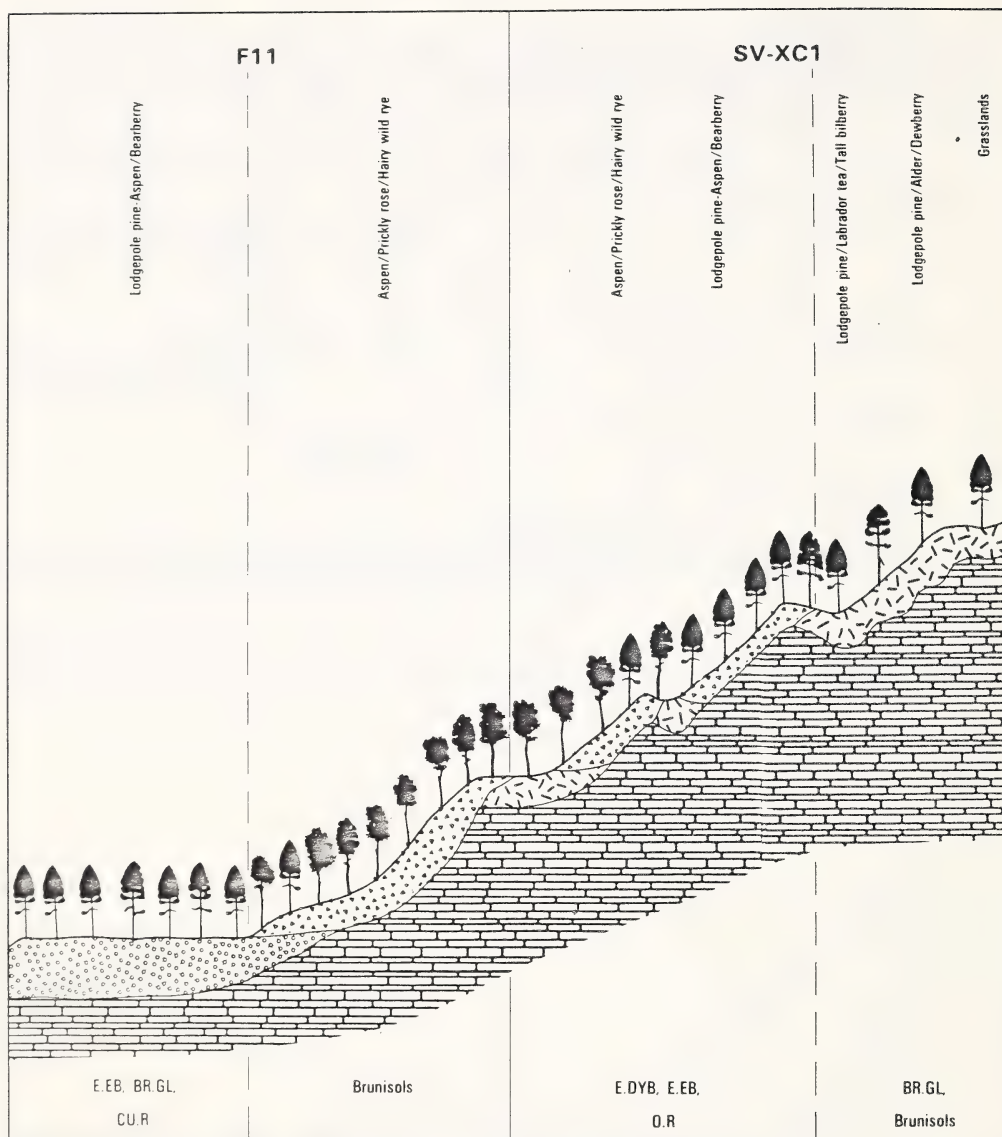


Figure 146: Schematic Diagram of Ecosections SV-XC1 and F11

Physical Conditions:

Located on the south side of the Smoky River valley and the headwaters of Norris Creek, this plateau remnant (Figure 147) has been extensively dissected by numerous headwater tributary streams resulting in extensive slumping and gullying. Surficial materials consist chiefly of residuum and till deposits of variable thickness overlying subdued to moderately rolling bedrock. Till deposits are generally thin and are comprised of a mixture of both Cordilleran and Continental tills. Small organic accumulations occur locally.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Xb}{R}, \frac{Mvb}{R}$	rSiL-SiCL	2-15	2-4	O.GL, BR.GL, GLBR.GL	Lodgepole pine/Tall bilberry/Five-leaved bramble Lodgepole pine/White-flowered rhododendron/Feathermoss Black spruce-Lodgepole pine/Tall bilberry
$\frac{Ov}{M}$	Mesic SiCL	0-2	5-6	Peaty Gleysols, Mesisols	Dwarf birch/Sedge/Sphagnum

Ecoregion: Subalpine
Boreal Uplands

Ecological Conditions

Local variation in drainage and topography creates the vegetation pattern, with lodgepole pine forest predominating over most of the ecosection; many of these pine stands are in a seral stage because of fires. Nearly level plateau remnants tend to be imperfectly drained and are characterized by black spruce-lodgepole pine forest with dwarf birch shrublands in small depressions.

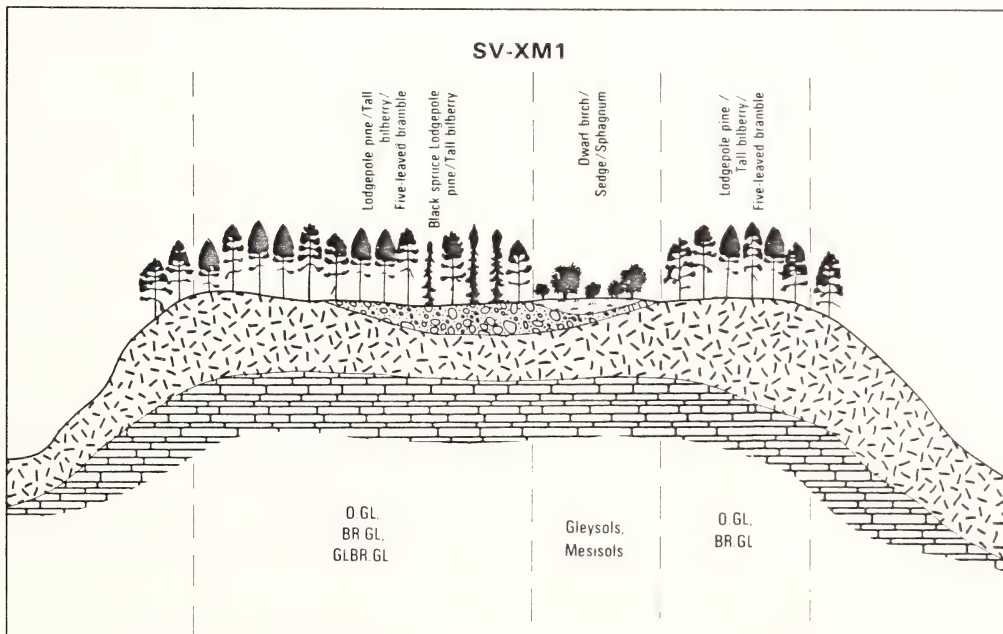


Figure 147: Schematic Diagram of Ecosection SV-XM1

2.4 The Rocky Mountain Region

The Rocky Mountains Region occurs in a very small portion of the study area (Figure 7). Hence, detailed information on the region will be discussed briefly within the subregion portion of the report.

2.4.1 The Park Ranges Subregion (Ecodistrict)

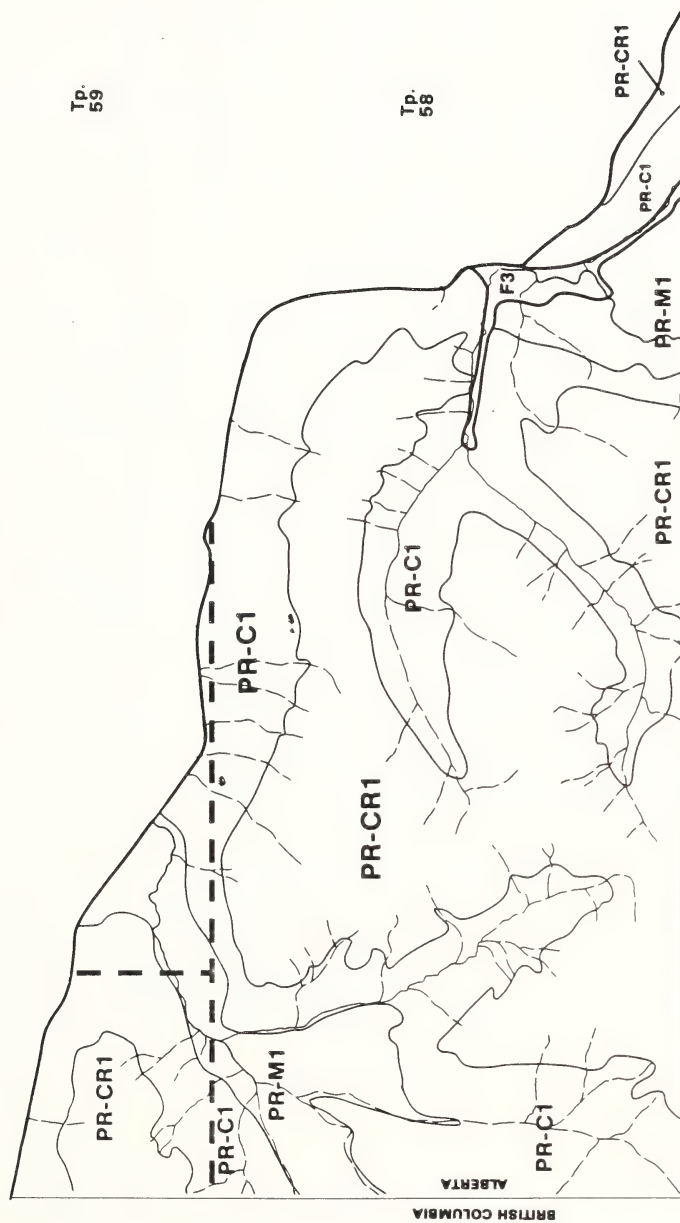
Only one subregion is located within that portion of the Rocky Mountain Region found within the study area (Figure 148). The subregion is centered around four mountain peaks, Kakwa Mountain (2 295 m), Mount May (2 449 m), La Creche Mountain (2 362 m) and one unnamed peak (2 184 m). The underlying strata are of Mesozoic age with the sandstones, siltstone and shales of the Nikanassin Formation and Fernie Group being dominant. Limestone of the Whitehorse Formation is present but its extent is limited.

The bedrock strata found within the Park Ranges subregion are very thick and have not been as extensively folded as strata found to the south of the study area within the main ranges of the Rocky Mountains. The folding and thrust faulting of the soft Mesozoic rocks has produced several sub-parallel ranges and valleys which are characterized by rapid horizontal and vertical variations in bedrock lithology. The streams which drain this subregion tend to flow across the northwesterly structural trend of the bedrock and expose strata of different lithologies.

Landforms within the subregion are the result of alpine glaciation which has created U-shaped valleys, cirques and aretes. Surficial

R.13

R.14



SCALE 1 : 100 000

km. 1.5 1.0 0 1.0 1.5 2.0 2.5 km.
mi. 1.5 0 1.0 1.5
West of the Sixth Meridian

Figure 148: Park Ranges Subregion (PR)

deposits across much of the subregion consists of colluvium and extensive areas of exposed bedrock. Minor deposits of moraine, residuum and recent fluvial materials are also prominent.

Within the Park Ranges both the Subalpine and Alpine ecoregions occur, the latter found on mountain tops devoid of treed vegetation. Areas of krummholtz vegetation (Engelmann spruce-Subalpine fir) generally mark the transition between the two ecoregions. The Alpine ecoregion supports a variety of alpine species including white mountain heather, mosses, willow and lichen. Below treeline, climax Engelmann spruce-Subalpine fir forest have developed. Within the major valleys where slopes are more moderate mature seral lodgepole pine forests occur.

The subregion is divided into three ecosection/systems (Table 28). Detailed descriptions with accompanying schematic diagrams follows.

The Park Ranges contain only one fluvial system (F3) of note. It is described in detail in Section 2.5 of Volume I.

Table 28

SUMMARY OF ECOSECTIONS IN THE PARK RANGES SUBREGION

ECOSECTION	LANDFORM AND TOPOGRAPHY	PARENT MATERIALS	VEGETATION
PR-C1	Moderate to steep slopes below treeline	Thin rubbly colluvium and exposed bedrock	Engelmann spruce-Subalpine fir forest
PR-CR1	Steeply sloping mountain tops above treeline	Exposed bedrock and thin rubbly colluvium	Alpine meadows
PR-M1	Rolling to strongly sloping lower slopes	Thin rubbly, moderately fine-textured till	Engelmann spruce-Subalpine fir and Lodgepole pine forest

Physical Conditions

Located below the treeline, this system consists of colluvial materials of variable thickness overlying moderate to extremely sloping bedrock (Figure 149). Surficial materials consist of unconsolidated weathered bedrock and colluviating till deposits on lower slope positions. Rock outcrops are very common on steep upper slopes while small colluvial fans occur on lower slope positions where extensive avalanching has occurred.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
$\frac{Cvb}{R}$	rL	10-70	1-4	O.R, O.EB, O.DYB, E.DYB, GLE.DYB	Engelmann spruce-Subalpine fir/ White-flowered rhododendron Engelmann spruce-Subalpine fir/Red heather

Ecoregion: Subalpine

Ecological Conditions

Continuous cover of Engelmann spruce-Subalpine fir forest on lower slopes is broken only by avalanche tracks which support seral shrubland communities. At higher elevations there is a transition from closed canopy forest to open canopy krummholz vegetation.

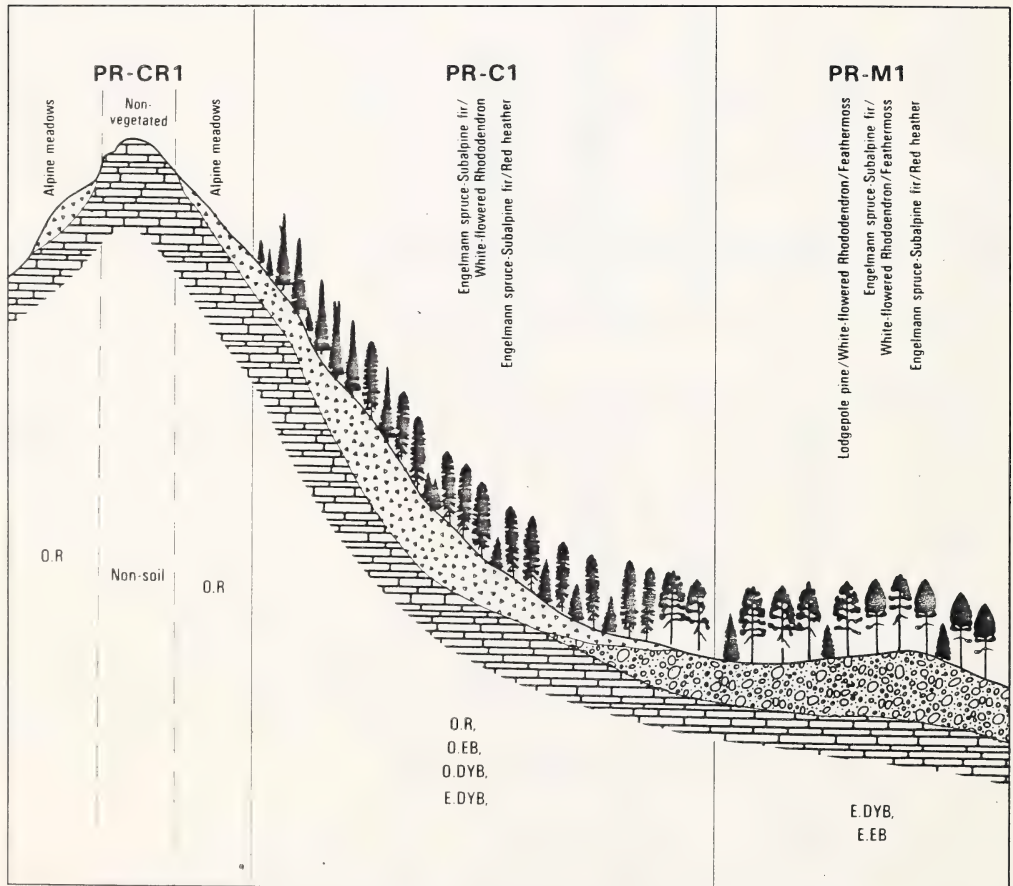


Figure 149: Schematic Diagram of Ecosystems PR-C1, PR-CR1 and PR-M1

Physical Conditions

This system is centered around four mountain peaks, Kakwa Mountain (2 295 m), Mount May (2 449 m), La Creche Mountain (2 362 m) and one unnamed (2 184 m) (Figure 149). The area consists of steep bedrock ridges covered with thin colluvial materials. Glacially sculptured features such as cirques, aretes and peaks are very prominent in this landscape, and preglacial frost features including stone stripes, stone nets and boulder fields are common on lower slopes. Several rock glaciers have developed within a cirque on the northeast face of Mt. May.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
R		71-100		Non-soil	Non-vegetated
Cv R	rl	31-100	1-2	O.R	Alpine meadows

Ecoregion: Alpine

Ecological Conditions

Exposure and variation in the depth of surficial materials influence the vegetation pattern above tree line. South-facing slopes, which tend to be steeper than other exposures, support alpine herbland with large areas that are non-vegetated. Greater accumulation and later retention of snow on northern exposures creates a more favorable moisture regime, and these slopes support dwarf shrublands and open krummholz. Sedge meadows occur locally on poorly drained level terrain such as the floor of cirques.

Physical Conditions

This system occurs in valley bottoms adjacent to Francis Peak Creek and the South Kakwa River (Figure 149). The landscape is characterized by moderate to strong slopes and rolling to inclined surfaces with a northeast aspect. Surficial materials are dominantly Cordilleran tills intermixed with residuum where till deposits are very thin. Thin veneers of fluvial and colluvial materials may be present in areas adjacent to steeper slopes.

MATERIALS	TEXTURE	SLOPE	DRAINAGE	SOILS	PLANT ASSOCIATION
Mvb R	r-SiCL	10-30	2-3	E.DYB, E.EB	Engelmann spruce-Subalpine fir/ White-flowered rhododendron Lodgepole pine/White-flowered rhododendron Engelmann spruce-Subalpine fir/ Red heather

Ecoregion: Subalpine

Ecological Conditions

Engelmann spruce-Subalpine fir covers most of these predominantly north-facing slopes. Lodgepole pine is less common, and is found mainly on southern exposures of small ridges. Large areas that have been burned are regenerating to lodgepole pine forest; regeneration is slow on steep slopes because the soil is very thin.

2.5 Fluvial Systems

Within this study, the valleys of major streams and rivers have been classified separately from the rest of the landscape. This system of classification reflects the fact that these valleys are more similar to each other than they are to the uplands they cross, primarily due to the dominant influence of erosional and depositional processes that are at work within these systems.

On the 1:50 000 scale Physical Land Classification maps which accompany the report, the landforms associated with fluvial systems have been mapped in accordance with Physical Land Classification Methodology (see Section 3). On the 1:100 000 scale Ecological Land Classification maps, a separate criteria was used to differentiate the various fluvial systems which occurred within the study area. The following parameters were used to separate and describe the individual fluvial systems; i.e. Fluvial System (X).

Stream Order	Refers to 4 classes: a) 1°-3° headwater tributaries b) 3°-4° lower tributaries c) 4°-5° middle reaches of major rivers d) 6° lower reaches of major rivers
Valley Form	Types of valleys (broad glacial, broad U-shaped, broad V-shaped with terraces, numerous V-shaped, etc.).
Floodplain	Types of floodplains (continuous broad, continuous narrow, discontinuous, absent, etc.)

Channel Form Types of channels (sinuous, bedrock controlled, braided, meandering, etc.).

Channel Slope Percent grade from topographic maps.

Valley and floodplain surficial materials and vegetation are also described for each fluvial system.

Flooding response was rated as fast, moderate or slow based on the following criteria:

- size of the watershed
- prevailing slope classes in watershed
- depth and texture of surficial materials

Channel stability was also rated as high, moderate or low based on:

- presence of braided reaches
- evidence of channel migration (oxbows, meander scars, scroll marks, etc.)
- occurrence of erosional scarps on banks

A more detailed description of the above factors can be found in Appendix A.

FLUVIAL SYSTEM - F1

This system is located upstream from Kakwa Falls on the Kakwa River.

STREAM ORDER : 3°

VALLEY FORM : Wide, gently sloping valley

VALLEY MATERIALS : Thin Cordilleran till over bedrock

CHANNEL FORM : Stable, continuous narrow floodplain with point bars present

CHANNEL GRADE : 0.5%

FLUVIAL MATERIALS: Fine to coarse gravels

SOILS : Well-drained Cumulic Regosols (50-75%); imperfectly-drained Orthic Regosols (25-50%)

VEGETATION

Valley Floor: Deciduous shrublands and lodgepole pine groves

Valley Sides: Closed lodgepole pine forest

NOTES : Confinement by bedrock creates stable stream course.

Thin coarse-textured soils cause rapid storm response.

FLUVIAL SYSTEM - F2

This system is located between Kakwa Falls and the confluence of Mouse Cache Creek with the Kakwa River.

STREAM ORDER : 3°

VALLEY FORM : This is a deep, steep-sided canyon (90% slopes, 30 m deep).

VALLEY MATERIALS : Exposed bedrock including resistant conglomerate beds of the Cadomin Formation.

CHANNEL FORM : Channel is restricted by bedrock sidewalls and is extremely stable.

CHANNEL GRADE : 2%

FLUVIAL MATERIALS: Gravel and boulders

SOILS : Well drained Cumulic and Orthic Regosols

VEGETATION

Valley Floor: White spruce and lodgepole pine forest

Valley Sides: Non-vegetated

NOTES : Thin, coarse-textured soils in watershed create rapid storm response

FLUVIAL SYSTEM - F3

This system includes a portion of the Kakwa River and its tributaries from its confluence with Mouse Cache Creek to 10 km northeast of its confluence with the South Kakwa River, as well as the middle and upper reaches of the South Kakwa River and the upper reaches of the Narraway River.

- STREAM ORDER : 1°-3°, 4° downstream from confluence of Kakwa and South Kakwa Rivers.
- VALLEY FORM : Broad glacially-carved valley with very strongly sloping valley walls adjacent to stream. This also includes intermittent tributaries in deep steep-sided valleys.
- VALLEY MATERIALS : Cordilleran till
- CHANNEL FORM : Broad continuous floodplain with a braided to meandering stream course.
- CHANNEL GRADE : 0.5-0.75% on main river. 5-8% on tributaries.
- FLUVIAL MATERIALS: Mixture of fluvial sands and gravels.
- SOILS : Well-drained Cumulic Regosols (25-50%); imperfectly-drained Orthic Regosols (25-50%); poorly-drained Gleysols and Mesisols (25-50%).
- VEGETATION
- Valley Floor: White spruce and lodgepole pine forests, dry-meadows-fluvial.
- Valley Sides: Lodgepole pine/Hairy wild rye on south exposures with White spruce/Feathermoss on other exposures.
- NOTES : Braided and meandering reaches indicate relatively low stability of stream course.
- Coarse-textured, thin soils on upper slopes and deep, compact soils on lower slopes cause a rapid to moderate storm response.

FLUVIAL SYSTEM - F4

This system includes Falls Creek and lower reaches of South Kakwa River, middle reaches of Copton Creek and lower reaches of Caw Creek, lower reaches of the Torrens River and Stetson Creek, Nickerson and Horn Creek, upper Narraway River including Dinosaur, Flume Creeks and Goat Creeks. These streams are located in the mountain or foothills portion of the study area.

- STREAM ORDER : 1°-3°, 4° on middle reaches of Copton Creek.
- VALLEY FORM : Steep sided, V-shaped valleys.
- VALLEY MATERIALS : Colluvium with slumping pronounced along the South Kakwa River where intermittent streams join the river as well as on Goat and Dinosaur Creeks. Bedrock exposures are common.
- CHANNEL FORM : Highly stable stream course confined by bedrock of valley walls. The streams are downcutting and there is no floodplain.
- CHANNEL GRADE : 2-6%
- FLUVIAL MATERIALS: Fine to coarse gravels

SOILS : Well-drained Cumulic Regosols (50-75%); imperfectly-drained Orthic Regosols (25-50%); poorly-drained Gleysols (10-25%).

VEGETATION

Valley Floor: Non-vegetated

Valley Sides: Lodgepole pine and spruce forests with grasslands on steep valley walls.

NOTES : Confinement by bedrock creates relatively stable stream courses.

Thin coarse-textured soils cause a rapid storm response.

FLUVIAL SYSTEM - F5

This system includes Francis Peak Creek, Lick Creek, Putzy Creek and the upper reaches of Copton Creek.

STREAM ORDER : 1°-2°

VALLEY FORM : Steep-sided V-shaped valleys

VALLEY MATERIALS : Mixture of till and colluvium

CHANNEL FORM : Fairly stable banks with channel being restricted by valley walls but not to same extent as F2. The streams are downcutting and have no floodplain.

CHANNEL GRADE : 2-3.5%

FLUVIAL MATERIALS: Fine to coarse gravels

SOILS : Well-drained Orthic Regosols (50-75%); imperfectly-drained Cumulic Regosols (25-50%).

VEGETATION

Valley Floor: White x Engelmann spruce forest

Valley Sides: White x Engelmann spruce forest

NOTES : Confinement by bedrock and lack of floodplain development indicate relatively stable stream courses.

Thin soils create rapid storm responses in these streams.

FLUVIAL SYSTEM - F6

The streams included in this system are Lynx Creek, Stinking Creek, Grizzly Creek, Adelaide Creek, Beaverdam Creek and Laforce Creek.

STREAM ORDER : 1°-3°, 4° on lower reaches of Beaverdam Creek

VALLEY FORM : Moderately to strongly sloping valley walls (KF-C3, KF-MX1).

VALLEY MATERIALS : A mixture of colluvium, moraine and residual with slope wash materials common in valley bottoms.

CHANNEL FORM : Broad, slightly meandering floodplain (0.25 km across). Was a braided stream in past.

CHANNEL GRADE : 3-4%

FLUVIAL MATERIALS: Sand with some gravels

SOILS : Well to rapidly drained Podzolic and Brunisolic Gray Luvisols and Regosols (50-75%); poorly drained Gleysols (25-50%).

VEGETATION

Valley Floor: Mixed dry and wet shrubland with open lodgepole pine stands. Some aspen and balsam poplar.

Valley Sides: Lodgepole pine

NOTES : Presence of meandering and braided reaches indicates stream courses have low to moderate stability.

Thin, rubbly and coarse-textured soils cause a relatively rapid storm response.

FLUVIAL SYSTEM - F7

This system is located in the upper reaches of the Torrens River.

STREAM ORDER : 1°-3°

VALLEY FORM : Steep sided slopes with broad (0.5 km) valley floor.

VALLEY MATERIALS : Colluvium on side slope with Cordilleran till on lower slope positions.

CHANNEL FORM : Slightly braided and meandering stream channel.

CHANNEL GRADE : 1.5-2%

FLUVIAL MATERIALS: Chiefly gravels and boulders with some sand.

SOILS : Well-drained Cumulic Regosols (50-75%); imperfectly-drained Orthic Regosols (25-50%).

VEGETATION

Valley Floor: White spruce and open shrubland

Valley Sides: Engelmann x white spruce, Lodgepole pine

NOTES: : Thin, coarse-textured soils cause a rapid storm response.

The presence of meandering and braided reaches indicates stream courses have low to moderate stability.

FLUVIAL SYSTEM - F8

This system includes the middle reaches of Kakwa River, the middle and lower reaches of Copton Creek, the upper reaches of Sheep Creek.

- STREAM ORDER : 1°-4° on Copton Creek to confluence of Beaverdam Creek, 5° downstream. 4° on Kakwa River, 5° downstream from its confluence with Copton Creek.
- VALLEY FORM : Glacially carved U-shaped valley, with moderate to steep sided slopes.
- VALLEY MATERIALS : Glaciofluvial terraces border most of these reaches with some moraine and colluvium deposits.
- CHANNEL FORM : Broad (0.25-1.25 km wide), meandering floodplain with relic oxbows and abandoned channels.
- CHANNEL GRADE : 0.3-0.7%
- FLUVIAL MATERIALS: Mixture of sands and gravels, with gravels predominating; gravel bars are common.
- SOILS : Well-drained Cumulic Regosols (25-50%); imperfectly drained Orthic Regosols (25-50%); and Brunisolic Gray Luvisols; poorly-drained Mesisols (25-50%).
- VEGETATION
- Valley Floor: White spruce/Common horsetail; fluvial shrublands; some small organics on floodplain; some aspen.
- Valley Sides: Aspen, lodgepole pine and white spruce
- NOTES : The presence of deep coarse-textured deposits on glaciofluvial terraces causes a moderate to slow storm response.
- The presence of abandoned channels and oxbows indicate relatively low stability of the stream course.

FLUVIAL SYSTEM - F9

This system includes Hat Creek and the lower reaches of Lynx Creek.

- STREAM ORDER : 1°-2°
- VALLEY FORM : Broad U-shaped valley
- VALLEY MATERIALS : Mixture of moraine, colluvium and glaciofluvial
- CHANNEL FORM : Relatively deep entrenched, actively downcutting and sidecutting meandering stream course.
- CHANNEL GRADE : 1.5-2%
- FLUVIAL MATERIALS: Sands predominate with some gravels
- SOILS : Well-drained Orthic and Cumulic Regosols

VEGETATION

Valley Floor: Shrublands

Valley Sides: Lodgepole pine

NOTES : Soils on upper slopes are thin and coarse-textured, but thick glaciofluvial deposits occur on lower slopes. This combination creates a rapid to moderate storm response.

The presence of only a few meandering reaches indicates a moderately stable stream course.

FLUVIAL SYSTEM - F10

STREAM ORDER : 4°

VALLEY FORM : Steeply sloping valley walls with nearly level, dissected valley train terraces.

VALLEY MATERIALS : Coarse-textured glaciofluvial sand and gravels with colluvial materials.

CHANNEL FORM : Deeply entrenched streams with no floodplain, sinuosity controlled by bedrock and actively down and side cutting.

CHANNEL GRADE : 1-1.5%

FLUVIAL MATERIALS: Complex of sands and gravels with gravels predominating.

SOILS : Well-drained Cumulic Regosols (50-75%); imperfectly-drained Orthic Regosols (25-50%).

VEGETATION

Valley Floor: Non-vegetated

Valley Sides: Aspen, lodgepole pine

NOTES : The occurrence of deep, coarse-textured glaciofluvial materials on lower valley sides creates a slow to moderate storm response.

Confinement by bedrock and the lack of floodplain development creates highly stable stream courses.

FLUVIAL SYSTEM - F11

This system is located on the upper reaches of the Smoky River including small feeder streams.

STREAM ORDER : 4°-5°

VALLEY FORM : Broad, U-shaped valley with nearly level, valley train glaciofluvial terraces and steep side slopes.

VALLEY MATERIALS : Complex of coarse to moderately coarse-textured glaciofluvial terraces and colluvium. Gullyng and slumping are common along the edges of the terraces.

CHANNEL FORM : Broad floodplain with sand and gravel bars common. The meandering stream course is confined to the 50 year floodplain and is side-cutting.

CHANNEL GRADE : 0.5%, 5-15% on feeder streams

FLUVIAL MATERIALS: Fluvial sands and gravels

SOILS : Well-drained Orthic Regosols (50-75%); moderately well-drained Cumulic Regosols (25-50%)

VEGETATION

Valley Floor: Balsam poplar, some white spruce

Valley Sides: Aspen/Rose/Hairy wild rye, Aspen-Lodgepole pine/ Bearberry

NOTES : The prevalence of meandering and the frequency of slumping due to oversteepening of terrace deposits indicates that the river course has low to moderate stability.

FLUVIAL SYSTEM - F12

This system includes Prairie Creek, the headwaters of the Cutbank River, Redrock and Little Redrock Creeks.

STREAM ORDER : 1^o-4^o

VALLEY FORM : A broad upland plateau to basin feature

VALLEY MATERIALS : Residual and moraine materials overlain by slopewash.

CHANNEL FORM : Slowly meandering to sinuous stream course with very little downcutting, floodplain not well-defined and no oxbows.

CHANNEL GRADE : 0.8-1%

FLUVIAL MATERIALS: Dominantly sands, some gravels and exposed bedrock.

SOILS : Well-drained Cumulic Regosols (70-90%); poorly drained Gleysols and Mesisols (10-30%)

VEGETATION

Valley Floor: Mixed grasslands and shrublands

Valley Sides: Mixed grasslands and shrublands

NOTES : The presence of moderately thin soils of variable texture causes these streams to have a rapid to moderate storm response.

The lack of floodplain development indicates that these streams are entrained in relatively stable courses.

FLUVIAL SYSTEM - F13

The streams included in this system are the middle reaches of Prairie Creek and its tributaries, lower reaches of Redrock Creek, Norris Creek, tributaries of the Kakwa River.

- STREAM ORDER : 1°-3°, 4° on lower reaches of Prairie and Redrock Creeks.
- VALLEY FORM : Narrow V-shaped valleys.
- VALLEY MATERIALS : Colluvium and moraine
- CHANNEL FORM : Small, narrow restricted floodplain with bedrock controlled channel. Slumps along banks caused by stream.
- CHANNEL GRADE : 1.5-2.5%, 3-5% on tributaries
- FLUVIAL MATERIALS: Mixture of sands and gravels
- SOILS : Well-drained Cumulic Regosols (50-75%); moderately well-drained Orthic and Brunisolic Gray Luvisols (25-50%)
- VEGETATION
- Valley Floor: Pine and spruce forests
- Valley Sides: Pine and spruce forests
- NOTES : The confinement of these streams in bedrock-controlled channels indicates stream courses are moderately stable.
- Thin soils in the upper watersheds of these streams cause moderate to rapid storm responses.

FLUVIAL SYSTEM - F14

This system is located on the middle reaches of the Torrens River.

- STREAM ORDER : 4°
- VALLEY FORM : Broad, glacially carved valley with wide valley bottoms.
- VALLEY MATERIALS : Glaciofluvial outwash with kames, eskers and meltwater channels. Some Cordilleran tills are found.
- CHANNEL FORM : Downcut through glaciofluvial materials and is now flowing over bedrock.
- FLUVIAL MATERIALS: Glaciofluvial cobbles with fluvial gravels.
- SOILS : Well to rapidly drained Brunisolic Gray Luvisols and Eluviated Eutric Brunisols.
- VEGETATION
- Valley Floor: Non-vegetated
- Valley Sides: Lodgepole pine, Black spruce

NOTES : The presence of thin, coarse-textured soils in the upper part of this large watershed creates a rapid storm response.

Having cut down to bedrock, the stream course has reached quasi-equilibrium and is relatively stable.

FLUVIAL SYSTEM - F15

This system includes the upper reaches of Stetson, Nose, Boulder, North Wolf and Sulphur Creeks and the upper reaches of the Cutbank River.

STREAM ORDER : 1-4°

VALLEY FORM : Broad, moderately sloping valley with organic deposits in the headwaters.

VALLEY MATERIALS : Mixture of colluvium and cordilleran tills

CHANNEL FORM : Small meanders in a narrow floodplain with slight side-cutting exposing a few eroded scarps.

CHANNEL GRADE : 1-3%

FLUVIAL MATERIALS: Fluvial cobbles and gravels with some sands

SOILS : Well-drained Cumulic Regosols (50-75%); imperfectly drained Orthic Regosols (25-50%).

VEGETATION

Valley Floor: Lodgepole pine and deciduous shrublands

Valley Sides: Lodgepole pine and White spruce forests

NOTES : The occurrence of slight meandering with only a few eroded scarps indicates a relatively stable stream course.

The predominance of thin, coarse-textured soils creates relatively rapid storm response.

FLUVIAL SYSTEM - F16

This system is located along Gunderson Creek.

STREAM ORDER : 1-4°

VALLEY FORM : Broad, former glacial meltwater channel with moderately to steeply sloping valley walls. Gunderson Creek is a misfit stream.

VALLEY MATERIALS : Colluvium and moraine deposits with slumping being common on valley walls.

CHANNEL FORM : Broad continuous floodplain with low flow rates in a meandering stream.

CHANNEL GRADE : 0.3-0.75%

FLUVIAL MATERIALS: Organics underlain by glaciofluvial gravels and fluvial silts.

SOILS : Rapidly drained Cumulic Regosols (50-75%); imperfect-drained Orthic Regosols (25-50%)

VEGETATION

Valley Floor: Open muskeg, with white spruce stands adjacent to creek.

Valley Sides: Lodgepole pine and aspen on south exposures with spruce on north exposures.

NOTES : Having cut through glaciofluvial deposits in the past, the stream is currently relatively stable.

The effect of thin, coarse-textured soils on upper slopes is modified by thick glaciofluvial deposits on the broad valley floor to create a moderate to slow storm response.

FLUVIAL SYSTEM - F17

This system includes Chicken Creek and other unnamed tributary feeder streams of the Kakwa River.

STREAM ORDER : 1-4°

VALLEY FORM : Gently sloping valley with stable parent materials.

VALLEY MATERIALS : Dominantly moraine with some localized colluvium.

CHANNEL FORM : Bedrock controlled channel with a discontinuous floodplain, very little cutting action.

CHANNEL GRADE : 2-3%

FLUVIAL MATERIALS: Mostly sands with some gravels

SOILS : Well-drained Orthic and Cumulic Regosols (50-75%); poorly drained Gleysols and Mesisols (25-50%).

VEGETATION

Valley Floor: Wet and dry fluvial meadows and white spruce

Valley Sides: Mixture of coniferous and deciduous

NOTES : The presence of Gleysolic and Organic soils on the gentle terrain around upper reaches creates a moderate storm response.

Bedrock control creates highly stable stream courses.

FLUVIAL SYSTEM - F18

This system includes the lower reaches of Boulder Creek, Nose Creek, Prairie Creek, and Muddy Creek and the middle reaches of Pinto Creek.

STREAM ORDER : 4-5°

VALLEY FORM : Broad, gently sloping valley

VALLEY MATERIALS : Morainal deposits, as well as glaciolacustrine.

CHANNEL FORM : Meandering stream course with a moderately wide continuous floodplain and a few oxbows.

CHANNEL GRADE : 0.5-1%

FLUVIAL MATERIALS: Gravels and cobbles with some sand

SOILS : Well-drained Orthic Regosols

VEGETATION

Valley Floor: White spruce forest, regenerating aspen

Valley Sides: White spruce forest, regenerating aspen

NOTES : The presence of deep soils derived from till causes moderate storm response.

The predominance of meandering reaches and the occurrence of oxbows indicates that stability of stream courses is low to moderate.

FLUVIAL SYSTEM - F19

This system is located on the lower reaches of Wolf Creek.

STREAM ORDER : 3-5°

VALLEY FORM : Broad, subdued valley

VALLEY MATERIALS : Morainal deposits and peat

CHANNEL FORM : Meandering stream course on a broad continuous floodplain.

CHANNEL GRADE : 0.5-1%

FLUVIAL MATERIALS: Fine fluvial gravels and silt

SOILS : Moderately well-drained Cumulic Regosols (50-75%); poorly-drained Mesisols (25-50%).

VEGETATION

Valley Floor: Deciduous vegetation on organics with white spruce, balsam poplar and aspen groves on gravels.

Valley Sides: Deciduous vegetation on organics with white spruce, balsam poplar and aspen groves on gravels.

NOTES : The predominance of deep soils derived from fine-textured continental till creates a moderate storm response.

The predominance of meandering reaches combined with a lack of oxbow and similar features indicates that the stream course is moderately stable.

FLUVIAL SYSTEM - F20

This system is located on the middle reaches of the Cutbank River.

STREAM ORDER : 5°

VALLEY FORM : Gently to moderately sloping broad valley. Some terraces scattered along river course.

VALLEY MATERIALS : Till predominates with some colluvium. Glaciofluvial and glaciolacustrine terraces.

CHANNEL FORM : Meandering stream course with numerous oxbows and point bars. There is a broad discontinuous floodplain. High steep banks with overhanging vegetation common.

CHANNEL GRADE : 0.5%

FLUVIAL MATERIALS: Fluvial cobbles with sand and silt.

SOILS : Well-drained Cumulic Regosols (50-75%); imperfectly drained Orthic Regosols (25-50%).

VEGETATION

Valley Floor: White spruce and balsam poplar groves with some deciduous shrublands.

Valley Sides: Lodgepole pine on lower slopes, aspen on upper slopes, black spruce and pines on terraces.

NOTES : The frequency of meandering and oxbows indicates that this stream course has moderate to low stability.

The occurrence of thin, coarse textured soils surrounding the upper reaches of this river creates a moderate to rapid storm response.

FLUVIAL SYSTEM - F21

This system includes the middle and lower reaches of the Narraway River, the middle reaches of the Kakwa River, Wapiti River and their feeder streams, the middle reaches of the Smoky River between the confluences with Norris Creek and the Kakwa River and the upper reaches of the Wapiti River where the Narraway joins it.

STREAM ORDER : 5°

VALLEY FORM : Steep sided, deep, fluvial valley with some terraces on the valley sides.

VALLEY MATERIALS : Colluvium and undifferentiated materials with exposed bedrock. Slumping and gullyng is common. The terraces are of glaciofluvial origin. Some portions have moraine and glaciolacustrine deposits.

CHANNEL FORM : The bedrock controlled channel is downcutting with a discontinuous floodplain (some minor point bars). The banks are gradual to abrupt but not vertical.

CHANNEL GRADE : 0.5-1.5%

FLUVIAL MATERIALS: Coarse gravels

SOILS : Well-drained Cumulic and Orthic Regosols (55-75%); moderately well-drained Eluviated Eutric Brunisols and Brunisolic Gray Luvisols (25-40%).

VEGETATION

Valley Floor: Non-vegetated

Valley Sides: Aspen on south exposures with lodgepole pine and black spruce on slumps.

NOTES : The relative lack of meandering reaches and floodplain development indicates that these river courses are relatively stable.

FLUVIAL SYSTEM - F22

This system includes Bolton Creek, tributaries of the Simonette River and the headwaters of the Latornell River.

STREAM ORDER : 1-3°

VALLEY FORM : Moderately steeply sloping V-shaped valleys

VALLEY MATERIALS : Moraine and colluvium

CHANNEL FORM : Narrow, continuous floodplain with a few meander scars and alluvial terraces.

CHANNEL GRADE : 0.5-1.5%

FLUVIAL MATERIALS: Silt and sand with some fluvial gravels.

SOILS : Well-drained Cumulic Regosols (55-75%); poorly drained Gleysols (25-45%).

VEGETATION

Valley Floor: Spruce and aspen/balsam poplar forest, discontinuous shrublands.

Valley Sides: Spruce and pine along Bolton Creek, pine and spruce along the Simonette tributaries.

NOTES : Beaver dams are obstructing portions of the Latornell headwaters.

The relative lack of meander scars on floodplains indicates that these stream courses are relatively stable.

The predominance of relatively thick and fine-textured soils combined with coarse-textured veneers around the Latornell River gives these streams a moderate to slow storm response.

FLUVIAL SYSTEM - F23

This system is located on the lower reaches of the Kakwa River and includes feeder streams on side slopes.

STREAM ORDER : 5° on Kakwa River, 1-2° on tributaries
VALLEY FORM : Broad, moderately sloping valley
VALLEY MATERIALS : Colluvium and till with slumping common
CHANNEL FORM : Sinuous channel with a discontinuous floodplain and alluvial terraces, point bars are common.
CHANNEL GRADE : 0.2-0.4%, up to 10% on feeder streams
FLUVIAL MATERIALS: Coarse gravel, cobbles and boulders
SOILS : Well-drained Cumulic Regosols (50-75%); imperfectly drained Orthic Regosols (25-50%)

VEGETATION

Valley Floor: Spruce forest

Valley Sides: Spruce forest

NOTES : Confinement of lower reaches by bedrock gives this river a relatively stable course.

FLUVIAL SYSTEM - F24

This system includes tributary streams of the lower reaches of the Kakwa, Cutbank and Smoky Rivers.

STREAM ORDER : 1-3°
VALLEY FORM : Steep sided, U to V shaped valleys. V-shaped valleys are more prominent to the north as streams downcut to meet the Kakwa River.
VALLEY MATERIALS : Moraine is predominant surficial material with some colluvium.
CHANNEL FORM : Sinuous, bedrock controlled channel with shallow abrupt banks.
CHANNEL GRADE : 1-2%
FLUVIAL MATERIALS: Sand, gravel and cobbles
SOILS : Poorly drained gleysols (50-75%); well drained Orthic Regosols and Brunisols (25-50%).

VEGETATION

Valley Floor: Lodgepole pine and spruce forests, secondary occurrence of shrubland and balsam poplar.

Valley Sides: Lodgepole pine and spruce forests, secondary occurrence of shrubland and balsam poplar.

NOTES : Storm response is slow to moderate as streams originate in organic areas, and watersheds are covered with relatively thick, coarse-textured soils.

Confinement by bedrock creates relatively stable stream courses.

FLUVIAL SYSTEM - F25

This system is the Little Smoky River in its entirety within the study area.

STREAM ORDER : 3-4°

VALLEY MATERIALS : Till and glaciofluvial sands, peat as well.

CHANNEL FORM : Continuous meandering floodplain with a deep clear water channel. Relic oxbows and meander scars are present.

CHANNEL GRADE : 0.1-0.2%

FLUVIAL MATERIALS: Glaciofluvial silt and sand

SOILS : Well-drained Cumulic Regosols (50-60%) and poorly drained Gleysols and Mesisols (40-50%).

VEGETATION

Valley Floor: Dry fluvial meadows and deciduous shrublands, lodgepole pine and white spruce on floodplain.

Valley Sides: Dry fluvial meadows and deciduous shrublands with lodgepole pine on glaciofluvial deposits.

NOTES : The occurrence of coarse-textured glaciofluvial veneers over moderately fine-textured till in this watershed creates a relatively slow storm response.

Although oxbows and meander scars are present, this river has cut into glaciofluvial materials and its present course is relatively stable.

FLUVIAL SYSTEM - F26

This system is located on the middle reaches of the Simonette River.

STREAM ORDER : 3-4°
VALLEY FORM : Steep, highly dissected valley walls.
VALLEY MATERIALS : Moraine and residual with colluvium (slumping).
CHANNEL FORM : Meandering stream course with some braided reaches. Point bars and oxbows common.
CHANNEL GRADE : 0.5-0.7%
FLUVIAL MATERIALS: Coarse gravels and cobbles
SOILS : Well-drained Cumulic Regosols (50-75%); poorly drained Gleysols (25-50%)
VEGETATION
Valley Floor: White spruce and black spruce forests and deciduous shrublands
Valley Sides: Lodgepole pine with some white spruce.
NOTES : The presence of braided reaches and oxbows indicates the stream course is relatively unstable, with shifting channel patterns caused by frequent slumps.
The prevalence of relatively deep fine-textured soils on slopes give streams a moderate stream response.

FLUVIAL SYSTEM - F27

This system is located on the lower reaches of the Simonette River.

STREAM ORDER : 3-4°
VALLEY FORM : Broad, gently sloping U-shaped valley
VALLEY MATERIALS : Morainal deposits
CHANNEL FORM : Continuous, broad floodplain with a meandering river channel. There are some braided reaches with point bars common.
CHANNEL GRADE : 0.3-0.5%
FLUVIAL MATERIALS: Fluvial gravels
SOILS : Well-drained Cumulic and Orthic Regosols (50-75%); poorly-drained gleysols (25-50%).

VEGETATION

Valley Floor: Aspen, white spruce, black spruce and deciduous shrublands.

Valley Sides: Aspen, white spruce and lodgepole pine.

NOTES : During floods a large area is flooded with shallow water.

The occurrence of large braided reaches indicates that stability of the stream course is relatively low.

FLUVIAL SYSTEM - F28

This system includes the headwater tributaries of the Little Smoky River.

STREAM ORDER : 1-2°

VALLEY FORM : Narrow, moderately sloping valleys

VALLEY MATERIALS : Organics in upper reaches with moraine on surrounding side slopes.

CHANNEL FORM : Meandering stream course flowing through organics.

CHANNEL GRADE : 0.9-1.2%

FLUVIAL MATERIALS : Sands and organics

SOILS : Poorly drained Mesisols and Gleysols

VEGETATION

Valley Floor : Deciduous shrublands and sedge meadows with some lodgepole pine stands

Valley Sides : Lodgepole pine

NOTES : This river has a relatively slow storm response because it originates in an area of organic soils and relatively thick, fine-textured till deposits covered with coarse-textured glaciofluvial materials predominate elsewhere in the watershed.

Streams are meandering but courses appear to be relatively stable.

FLUVIAL SYSTEM - F29

This system is Deep Valley Creek and its tributaries.

STREAM ORDER : 1-3°

VALLEY FORM : U-shaped valley with moderately to strongly sloping valley walls.

VALLEY MATERIALS : Dominantly colluvium derived from moraine, Tertiary gravels and residual.

CHANNEL FORM : Meandering to sinuous stream course with extensive glaciofluvial deposits bordering channel.

CHANNEL GRADE : 1.0-1.5%

FLUVIAL MATERIALS: Sand with organics on floodplain.

SOILS : Poorly drained Mesisols (55-75%); poorly drained Mesisols and Gleysols (21, 41.1).

VEGETATION

Valley Floor: Lodgepole pine on glaciofluvial deposits with dwarf birch and black spruce on wet areas.

Valley Sides: Lodgepole pine

NOTES : Prominent kame and sinuous esker complexes occur in valley bottom.

Most of these watersheds consist of a nearly level plateau and valley wall materials are thick, giving streams a moderate to slow storm response.

The lack of braided reaches and recent meander scars indicates that stream courses are relatively stable.

FLUVIAL SYSTEM - F30

This system is located on the middle to upper reaches of Muddy Creek.

STREAM ORDER : 2-4°

VALLEY FORM : Gentle to moderately sloping U-shaped valley

VALLEY MATERIALS : Dominantly moraine deposits

CHANNEL FORM : Strongly meandering stream with a discontinuous floodplain. It has steep banks with slumping common in middle reaches. Where a floodplain is present oxbows are common.

CHANNEL GRADE : 0.6-0.75%

FLUVIAL MATERIALS: Mixture of sands and gravels

SOILS : Well-drained Cumulic Regosols (50-75%); imperfectly-drained Orthic Regosols (25-50%).

VEGETATION

Valley Floor: White spruce and balsam poplar

Valley Sides: Aspen, white spruce and black spruce

NOTES : The prevalence of deep, fine-textured soils across this large watershed gives streams a relatively slow storm response.

The commonness of erosional scarps and the occurrence of oxbows indicates that the stream course has moderate to low stability.

FLUVIAL SYSTEM - F31

This system includes the lower reaches of Nose and Pinto Creeks.

STREAM ORDER : 5° on nose, 4° on Pinto Creek

VALLEY FORM : Deeply incised, V-shaped valley with erosional scarp faces common.

VALLEY MATERIALS : Undifferentiated colluvium with slumping common.

CHANNEL FORM : Very sinuous stream course with low-lying alluvial terraces. They are downcutting and sidecutting through glaciolacustrine sediments with a minor occurrence of point bars.

CHANNEL GRADE : 0.4-0.5%

FLUVIAL MATERIALS: Silts and sands with some gravels

SOILS : Well to moderately well-drained Orthic and Cumulic Regosols.

VEGETATION

Valley Floor: Aspen and white spruce

Valley Sides: Aspen and white spruce with some balsam poplar

NOTES : The predominance of deep, fine-textured soils gives streams a relatively slow flood response.

The lack of meander scars indicates that stream courses are moderately stable despite the erodability of valley floor materials.

FLUVIAL SYSTEM - F32

The streams included in this system are the tributary streams of lower Nose, Calahoo and Sylvester Creeks.

STREAM ORDER : 1-3°

VALLEY FORM : Deeply incised V-shaped valleys

VALLEY MATERIALS : Glaciolacustrine and glaciofluvial materials with slumping common.

CHANNEL FORM : Sinuous stream course with no floodplain. Downcutting is the major process.

CHANNEL GRADE : 1.2-1.7%

FLUVIAL MATERIALS: Predominantly silts and clays with some sand

SOILS : Well to moderately well drained Orthic Regosols.

VEGETATION

Valley Floor: Non-vegetated

Valley Sides: Aspen and white spruce

NOTES : These streams carry a heavy suspended load due to downcutting through glaciolacustrine sediments.

Rapid downcutting through erodable materials make stream courses relatively stable.

The predominance of deep, fine-textured soils covered with coarse-textured overlays gives streams a moderate to slow storm response.

FLUVIAL SYSTEM - F33

This system includes the upper reaches of Pinto Creek and the upper and middle reaches of Big Mountain and Bald Mountain Creeks.

STREAM ORDER : 2-4°

VALLEY FORM : Subdued valley with streams shallowly entrenched

VALLEY MATERIALS : Glaciolacustrine sediments.

CHANNEL FORM : Meandering stream course with a discontinuous floodplain and relic oxbows. Steep banks have low level slumps occurring.

CHANNEL GRADE : 0.1-0.4%

FLUVIAL MATERIALS: Silts and sands

SOILS : Imperfectly drained Cumulic Regosols (50-75%); moderately well-drained Orthic Regosols (25-50%).

VEGETATION

Valley Floor: White spruce, balsam poplar and deciduous shrublands.

Valley Sides: Aspen

NOTES : The commonness of erosional scarp faces and oxbows indicates that stability of stream courses is moderate to low.

Gentle slopes in watersheds characterized by deep, fine-textured soils give streams a moderate to slow storm response.

FLUVIAL SYSTEM - F34

This system includes the upper middle reaches of the Cutbank River.

- STREAM ORDER : 3-4°
- VALLEY FORM : Very steeply sloping, confined U to V-shaped valley.
- VALLEY MATERIALS : Colluvial materials with slumping common.
- CHANNEL FORM : Continuous floodplain with gravel bars, meander scars and relic oxbows. The stream course is not well defined and the floodplains up to 0.5 km wide.
- CHANNEL GRADE : 0.5-0.6%
- FLUVIAL MATERIALS: Sands and gravels with sands dominating
- SOILS : Well drained Cumulic and Orthic Regosols
- VEGETATION
- Valley Floor: White spruce forests with some open deciduous shrublands
- Valley Sides: Aspen, white spruce and lodgepole pine with white spruce dominating on lower slopes.
- NOTES : Poor definition of the stream course and the presence of meander scars indicate that stability of the stream course is moderate to low.
- The predominance of thin, coarse-textured soils in headwater reaches gives this river a moderate to rapid storm response.

FLUVIAL SYSTEM - F35

This system includes the tributary streams of the Cutbank River.

- STREAM ORDER : 2-3°
- VALLEY FORM : Broad, U-shaped valleys with steep slopes
- VALLEY MATERIALS : Dominantly colluvium with slumping common. Alluvial fans and slope wash materials are present on wet valley bottoms.
- CHANNEL FORM : Sinuous channel with a continuous, narrow floodplain. Relic oxbows are found in the middle reaches.
- CHANNEL GRADE : 0.8-1.6%
- FLUVIAL MATERIALS: Sand and silt
- SOILS : Well drained Cumulic Regosols (50-75%); well-drained Orthic Regosols (25-50%)

VEGETATION

Valley Floor: Deciduous shrublands, black spruce and white spruce.

Valley Sides: Aspen, white spruce and lodgepole pine

NOTES : Stream courses have relatively low stability in reaches with low slopes, but are otherwise moderately stable.

The predominance of deep, coarse-textured soils gives streams a moderate storm response.

FLUVIAL SYSTEM - F36

This system includes the lower middle and lower reaches of the Cutbank River with feeder streams and the lower reaches of Big Mountain Creek.

STREAM ORDER : 5°

VALLEY FORM : Moderately sloping V-shaped valley cut through a glaciolacustrine basin.

VALLEY MATERIALS : Glaciolacustrine and colluvium with pronounced slumping on valley sides.

CHANNEL FORM : Meandering stream course with a discontinuous floodplain, relic oxbows, meander scars and gravel bars. Stream course has shifted as a result of slumping. Some alluvial terraces are present.

CHANNEL GRADE : 0.3-0.5%; up to 3% on feeder streams.

FLUVIAL MATERIALS: Gravels, silts and sands

SOILS : Moderately well drained Cumulic Regosols (50-75%); imperfectly to poorly-drained Rego Gleysols (25-50%).

VEGETATION

Valley Floor: Non-vegetated

Valley Sides: Aspen, black spruce and some white spruce

NOTES : Streams have heavy silt loads because of erodability of watershed materials.

Extensive occurrence of oxbows and meander scars indicates stability of the stream course is moderate to low.

The occurrence of deep, fine-textured soils gives these streams a moderate storm response.

FLUVIAL SYSTEM - F37

This system includes the middle reaches of the Latornell River.

STREAM ORDER : 3°

VALLEY FORM : Moderately sloping, narrow U-shaped valley

VALLEY MATERIALS : Glaciolacustrine with some glaciofluvial

CHANNEL FORM : Discontinuous floodplain with a sinuous flow pattern controlled by valley materials.

CHANNEL GRADE : 0.3%

FLUVIAL MATERIALS: Range from silt to coarse gravel

SOILS : Imperfectly drained Cumulic Regosols (50-75%); well drained Eluviated Eutric Brunisols (25-50%).

VEGETATION

Valley Floor: White spruce and deciduous shrubland

Valley Sides: White spruce, black spruce and balsam poplar

NOTES : Storm response is moderately slow because of thick, fine-textured soils with high water storage capacity.

The stream course is relatively stable because of control by valley wall materials.

FLUVIAL SYSTEM - F38

This system is located on the lower reaches of the Latornell River.

STREAM ORDER : 4°

VALLEY FORM : Shallow, box-shaped valley cut into a glaciolacustrine plain

VALLEY MATERIALS : Glaciolacustrine

CHANNEL FORM : Highly meandering stream course through a continuous floodplain. There are numerous low alluvial terraces.

CHANNEL GRADE : 0.2-0.3%

FLUVIAL MATERIALS: Silts, sands and some gravels

SOILS : Moderately well-drained Cumulic Regosols (50-75%); imperfectly to poorly drained Rego Gleysols (25-50%).

VEGETATION

Valley Floor: Balsam poplar, white spruce and deciduous shrublands.

Valley Sides: Aspen

NOTES : Stream has a heavy silt load.

The presence of numerous oxbows and meander scars indicates a relatively unstable stream course.

The prevalence of deep, fine-textured soils with coarse-textured overlays and the subdued topography in this watershed creates a relatively slow storm response.

FLUVIAL SYSTEM - F39

This system includes portions of Lignite and Economy Creeks.

STREAM ORDER : 1-2°

VALLEY FORM : Subdued valleys cut through glaciolacustrine deposits.

VALLEY MATERIALS : Glaciolacustrine

CHANNEL FORM : Meandering stream coarse with a discontinuous floodplain.

CHANNEL GRADE : 0.3-0.5%

FLUVIAL MATERIALS: Silt and sand

SOILS : Poorly drained Rego Gleysols (50-75%); moderately well-drained Cumulic Regosols (25-50%).

VEGETATION

Valley Floor: Balsam poplar and deciduous shrublands

Valley Sides: Aspen

NOTES : Storm response is slow because of deep, fine-textured soils and subdued topography in the watershed.

The lack of shifting channel features indicates that these small streams have relatively stable courses.

FLUVIAL SYSTEM - F40

This system is located on the lower reaches of the Smoky River.

STREAM ORDER : 6°

VALLEY FORM : Deeply incised into a glaciolacustrine plain this is a broad box-shaped valley with colluvium on relic banks 0-2 km from present stream course. There are also narrow, deeply-incised, steep-sided tributary valleys. Glaciofluvial terraces occur on valley sides.

VALLEY MATERIALS : Glaciolacustrine, colluvium and glaciofluvial materials.

CHANNEL GRADE : 0.1-0.2%

FLUVIAL MATERIALS: Dominantly gravels, finer materials have been removed because of high flow rates.

SOILS : Well-drained Cumulic Regosols (50-75%); imperfectly-drained Rego Gleysols (25-50%).

VEGETATION

Valley Floor: Aspen, balsam poplar, white spruce and deciduous shrublands.

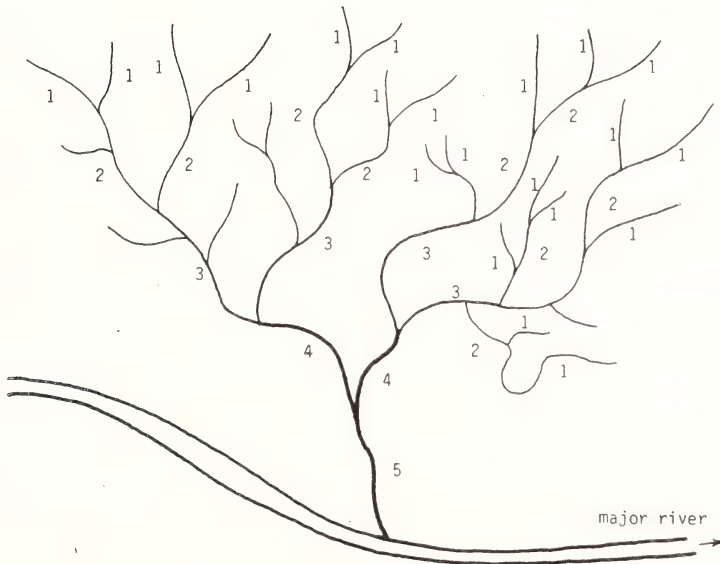
Valley Sides: Aspen and white spruce forests

NOTES : Although oxbows and meander scars on elevated terraces indicate low stability in the past, the present stream course is moderately stable.

APPENDIX A
PROPERTIES OF PERMANENT STREAMS

I. CHANNEL ORDER

- A. A sequential order system is used (Strahler, 1952). The first order represents the smallest permanent stream mappable.
- B. Described as follows:
- headwater tributaries (1-3)
 - lower tributaries (3-4)
 - middle reaches of major rivers (4-5)
 - lower reaches of major rivers (6)



II. MORPHOLOGY

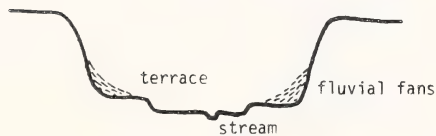
1. Broad Glacial Valley

- with or without terraces
- glacial meltwaters and spillways
- underfit streams



2. Broad U-Shaped Valley

- with or without terraces
- major rivers and secondary rivers usually
- may have fluvial fans
- more bedrock control
- may include point bars, lower fluvial terraces



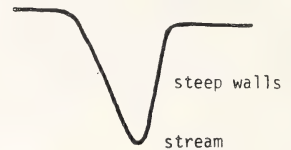
3. Box-Shaped Canyon

- bedrock controlled
- vertical walls



4. Narrow V-Shaped Valley

- often first to third order streams
- banks are steep (55-70%)



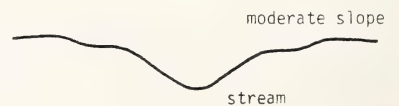
5. Broad, Large V-Shaped Valley

- with or without terraces
- bedrock control
- strongly dissected
- 45-60%



6. Wide, Small V-Shaped Valley

- moderately dissected
- moderately sloping 45-60%
- moderate to high flow gradient



7. Low Relief Channels

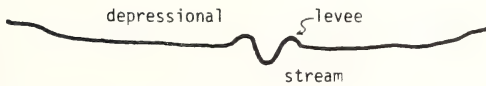
(a) Low Banks

- characteristic of bogs and meadows
- sometimes intermittent
- usually low flow gradient
- low banks-water close to the surface



(b) High Banks

- channels with high banks but with low relief around the channel
- often depressional with wetlands



8. Partial U-Shape

- landform control on alternate banks
- usually till or bedrock
- bank control dependent on materials
- moderate to large substrate usually
- lower bank usually forested



9. Sloping Valley Walls

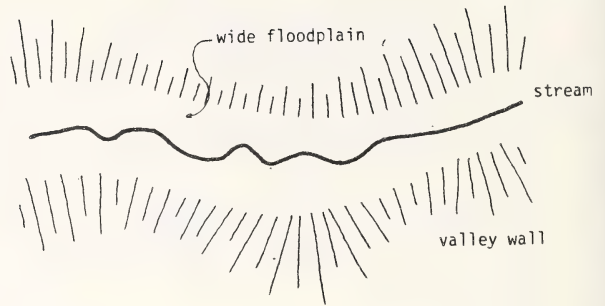
- a. regular
- b. stepped
- c. active
- d. stable



III. FLOODPLAINS

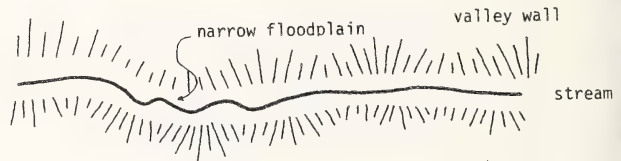
1. Continuous Broad

- normally within wide valleys



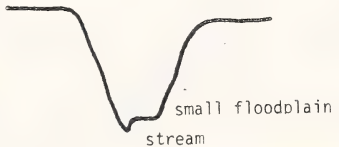
2. Continuous Narrow

- confined valleys



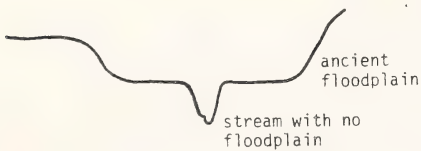
3. Discontinuous

- often in confined valleys



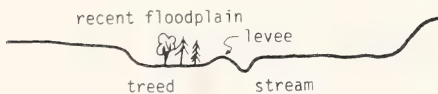
4. Absent

- steep walled valleys, entrenched streams



5. Recent

- river recently created new floodplain, may be vegetated



IV. CHANNEL MORPHOLOGY

1. Straight

- minor curvature within a reach



2. Sinuous

- significant curvature within a reach



3. Irregular Sinuous

- a channel pattern which is not straight or sinuous and does not have a repeatable pattern. Often this is the result of structurally controlled (bedrock) terrain or parent geological materials (i.e. till)



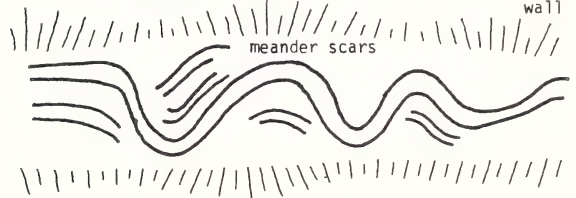
4. Classical Braiding

- unstable and overlapping islands, found on glacial outwash plains; valley trains and alluvial fans in mountains or foothills; coarse floodplains; often sand and gravel materials



5. Confined Meanders

- often bedrock controlled valley with meandering river confined by valley walls



6. Entrenched Meanders

- bedrock or material controlled meanders (meanders may have origin in overlying material or in stagnant ice)



7. Regular Meanders

- channel pattern is characterized by a repeatable pattern



8. Tortuous Meanders

- channel pattern is more or less repeatable but much more contorted. This is very common in area with flat topography and fine textured surficial deposits



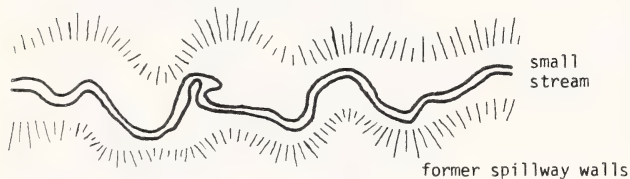
9. Unconfined Meanders with Oxbows

- occurs on muskeg and silt or sand-filled former glacial lake beds and flat-gradient valleys filled with thick, medium textured alluvium



10. Meanders within Meanders

- misfit streams flowing in former glacial spillways



11. Irregular Channel Splitting with Islands (Anastomosing Pattern)

- large rivers in bedrock valleys contains intermittent sand and gravel islands



12. Rectangular Channels

- bedrock controlled, jointed or faulted.



V. CHANNEL AND VALLEY MATERIALS

Fine	0 to 2 mm	or	0 to 2 mm
Moderate	2 mm to 256 mm		2 to 100 mm
Coarse	256 mm +		100 + mm

The first is a simplified form of the classes used by most of Fish and Wildlife. The other was used in B.C. for mapping purposes.

Descriptors:

1. Description and cover of parent geologic material and bedrock; the cover should be identified to the nearest 10%.
2. The geomorphic process associated with the materials may be included.
3. Outcrops within the substrates should be included.

VI. CHANNEL GRADIENT

Slope is the average slope of the reach (elevation or rise over the length). Slope is given to the nearest percent above 3%, and to the nearest 0.1%). Slopes are measured from the topographic map.

Descriptors:

	Steep	greater than 5%
	Shallow	less than 5% (Chamberlain, 1977)
or	Low	0-3%
	Moderate	3-5%
	High	greater than 5% (Nelson, 1984)

VII. VEGETATION

- vegetation physiognomy as per manual or any additions found to be necessary.
- should include a vegetation association if possible.

(The vegetation is important and has been found to be a good indicator of fisheries productivity and habitat (pers. comm. Dave Halstead).

